

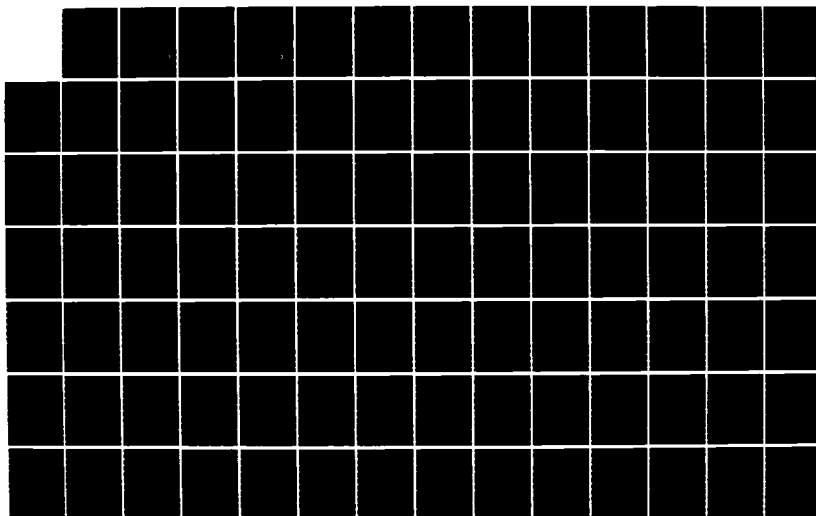
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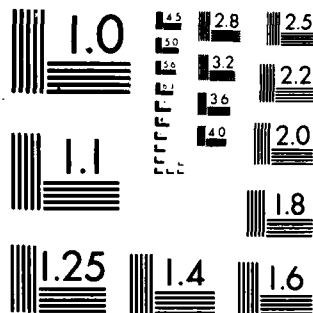
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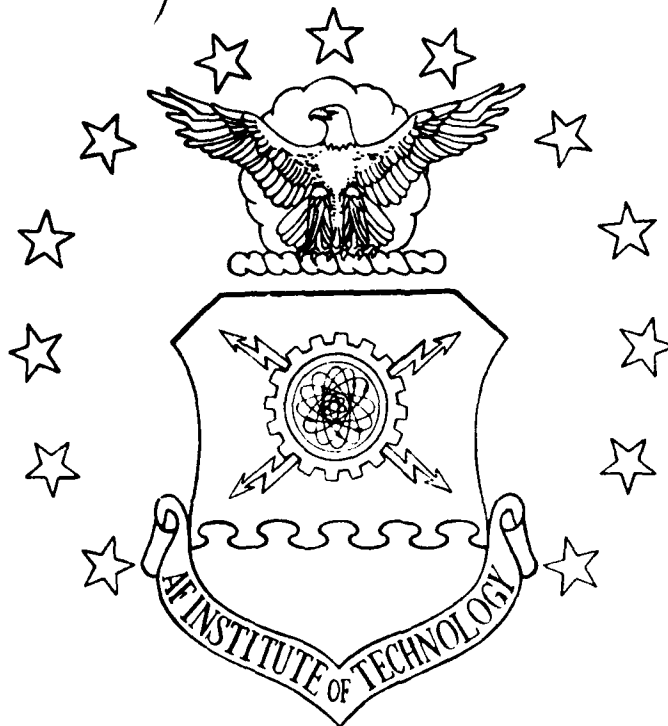
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AN INVESTIGATION CONCERNING PERCEPTIONS
OF MILITARY CONSTRUCTION PROGRAM
EFFECTIVENESS BY THE APRCES, THE MAJCOMS
AND THE BASES

THESIS

Gerald B. Dutcher
Captain, USAF

AFIT/GEM/LSM/86S-10

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AN INVESTIGATION CONCERNING
PERCEPTIONS OF MILITARY CONSTRUCTION PROGRAM
EFFECTIVENESS BY THE APRCES, THE MAJCOMS, AND THE BASES

THESIS

Presented to the Faculty of the School of Engineering
of the Air Force Institute of Technology

Air University

In partial Fulfillment of the Requirements for the Degree of
Master of Science in Engineering Management

Gerald B. Dutcher, B.S.
Captain, USAF

September 1986

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Abstract

In this thesis the primary inefficiencies of the Military Construction Program (MCP), as commonly perceived by the Air Force Region Civil Engineer (AFRCE), the Major Command (MAJCOM), and the bases are identified. These three management levels are the primary managers of the MCP program. The MCP problems identified included inadequate definition of scope at the inception of MCP projects, and ineffective technical and functional design reviews.

Data was gathered from the AFRCE, the MAJCOM and the base through 770 questionnaires, mailed throughout the continental United States. All of the personnel involved with the MCP were surveyed at the AFRCEs and MAJCOM. The base personnel were randomly sampled.

The methodology used involved a oneway analysis of variance of the mean responses, from the AFRCE, the MAJCOM and the base, to a seven point likert scale. Significant opinion differences were verified with the Scheffe test for all possible comparisons.

AN INVESTIGATION CONCERNING PERCEPTIONS OF MILITARY
CONSTRUCTION PROGRAM EFFECTIVENESS BY THE AFRCES, THE MAJCOMS
AND THE BASES

I. Introduction

Chapter Overview

A brief background is presented here to familiarize the reader with the Military Construction Program, followed by a description of the general issue of concern. Next, the specific problem, and the scope and limitations of the research, are discussed. Finally, the research questions used to study the problem are presented and briefly discussed.

Background

The mission of the Air Force civil engineering organization "is to provide the necessary assets and skilled personnel to prepare and sustain global installations as stationary platforms for the projection of aerospace power in peace and war" (5:2). The Military Construction Program (MCP) supports the Air Force's mission to "sustain global installations," by providing the facilities for military operations and installations.

The MCP process, which is discussed in detail in Chapter 2, is the primary method for obtaining new facilities and major renovation projects in the Air Force. The process is triggered by a recognized need for a facility and begins

with preparation of programming documentation at each base. The programming documentation is submitted through the base's Major Command (MAJCOM) to Headquarters Air Force and finally to Congress for approval and authorization. As the programming process is completed, the design and construction process begins. The design and construction of an approved project is generally accomplished by the U.S. Army Corps of Engineers or the Naval Facilities Engineering Command, as designated by Headquarters USAF (17:36) but may be assigned to the Air Force (1). The Air Force Regional Civil Engineer (AFRCE) is tasked with management of the design and construction phases of the Air Force Military Construction Program (12:2-94). The MAJCOMs and bases involved provide support to the AFRCE (17:36).

Accordingly, it is important to ensure that each base, MAJCOM and AFRCE operate effectively within the framework provided by the MCP process. Yet, evidence discussed below suggests that either the bases, the MAJCOMs, the AFRCEs, the MCP system itself or some combination thereof are not working together effectively.

General Issue.

The MCP process has long been the subject of controversy and indeed is "So complex and tedious . . . that it took a flow chart 18 feet long to describe construction activities" (12:2-94). The design staff of the construction division at Headquarters USAF was responsible for \$2,234,988,000 in 1984

and is projected to be \$3,921,239,000 in 1986 (12:2-41). This is a huge program which requires a smooth and effective organization to ensure the maximum number of MCP projects are funded. A realization of the importance and the complexity of the MCP system led to this investigation of the perceptions of the three main civil engineering players in the MCP process: The APRCEs, the MAJCOMs and bases.

The perception by many experts that the MCP system could be improved was the general area of concern. More specifically, discussions with Major Donald E. Murphy (16) and his colleagues, from the Management Applications branch in the School of Civil Engineering (SOCE), and a thesis written by Capt Ruth I. Larson (15) verified that a problem with the MCP process did exist. Finally, Maj. Gen. Clifton D. Wright (USAF, retired), previous Director of Engineering and Services apparently entertained similar perceptions (24).

The concerns voiced by Major Murphy and his colleagues were based on SOCE student complaints (both MAJCOM and base level) expressing a strong dissatisfaction with the Military Construction Program. For example, complaints that the APRCE is not responsive or sensitive to specific base needs were very common. Their experiences in the classroom led them to believe this dissatisfaction could be affecting the effectiveness of the Military Construction Program.

Capt Larson (15) in her thesis concerning the facility acquisition system provided specific concerns. For instance,

she reported that requirements are seldom fully identified, accuracy of programming documents is often questionable and regulations do not always provide adequate, up-to-date procedural information (15:85,99,100).

Considering the size and complexity of the MCP, these problems should represent a major concern to the Air Force. Maj. Gen. Wright (USAF, retired), voiced a perception that our current construction process produces poor bid documents, accepts design packages "filled with errors, omissions, or other problems" (24:16) which inevitably resulted in "excessive changes and claims . . . [leading to] missed completion dates, inferior products, and, in all probability, cost overruns" (24:16). These concerns led Maj. Gen. Wright to state, "...our credibility with Congress is less than I would like. We are constantly being put on the defensive because of problems we ourselves created and could have avoided" (24:16).

Problem Statement.

The purpose of this study was to determine what types of problems exist based upon the perceptions of the three main players in the MCP process. The issue of concern was the perceptions of the AFRCF, MAJCOM and base personnel in four distinct areas relative to the MCP: First, their thoughts on the interpretation and sufficiency of directives governing the program; second, concerns relative to communications between the involved organizations; third, their appraisal of

Structure: Are the regulations, guidance and procedures effectively providing a structure which allows efficient operation of the MCP?

This research question was translated to a series of measurement questions designed to determine if the operating structure created by the regulations, procedures, pamphlets, guidance, etc. is effective.

Communication: How effective are the informal and formal communications between the players (AFRCE, MAJCOM, and base)?

Considering the size and complexity of the MCP, efficient information flow is paramount to the success of the program. Thus, the communication question resulted in a number of measurement questions designed to investigate the effectiveness of the established communication system between the three players.

Performance: How well are the given procedures implemented to ensure that the MCP process is effective?

This final research area considers the effectiveness of the players in performing their functions within the structure of the MCP process. The measurement questions in this area attempt to determine how well the players are doing their job, as opposed to how well the MCP process is providing a structure within which to perform that job.

II. Literature Review

Chapter Overview

The Military Construction Program is an extremely complicated process which consists of three interrelated and synergistic phases: The programming phase, the design phase and the construction phase. To fully understand the process a general discussion of the overall Military Construction Program will be presented first. This discussion will then be followed by a detailed presentation of each phase of the Military Construction Program.

Military Construction Program

The Military Construction Program (MCP), also known as the facility acquisition process "follows essentially the same pattern for all projects, no matter how the requirements are generated" (15:19). The four phases of Facility Acquisition are 1) requirements identification, 2) programming, 3) design and 4) construction. The requirements identification and the programming phase are lumped together as a single programming phase under the Military Construction Program (2:13). The following brief discussion of the Military Construction Program will aid in understanding the functions of each of the three main players (the AFRCE, the MAJCOM and the base) and the three phases of the MCP.

Programming is the first phase of the MCP and includes the identification of specific projects. The primary purpose

of this phase is to perform the analysis necessary, not only to determine feasibility, but also to establish the major parameters of the project, to include functional requirements identification, cost estimates, and concept design (35: design complete). The product of this phase is a "justification document and/or decision to proceed to the next phase, based upon the criteria and procedures spelled out in the law." (12:1-26). The programming overlaps with the second phase (design) because "Some level of design is usually accomplished . . . in order to support the decision-making process, refine the scope of projects, and provide better estimates of funding needs." (12:1-27).

The design phase covers the time spent in the preparation of "specific design and contract documents . . . so that the project may be constructed." (12:1-27). The overlap between the first and second phase occurs because design can be both "preliminary sketches" (24:397) and "a plan . . . to work from" (24:397). Accordingly, preliminary designs and estimates must be prepared in the programming phase. The preliminary designs are used in the design phase to create final project designs and contract documents. It is not uncommon to revise project design throughout this phase "based upon different requirements . . . , complaints or inputs from other Federal agencies, public involvement, changed design standards, and changes in scope." (12:1-27).

After revisions are incorporated and the designs are completed, the final phase, construction, will begin.

The construction phase consists of "solicitation of bids from private sector contractors, management of the construction of the project, and final inspection and acceptance of the project." (12:1-27). In other words, all of the work required to contract for and construct a useable facility are part of this phase.

With this basic understanding of the three MCP phases a detailed explanation of the decision flow of each phase will provide a better understanding of the overall process.

Programming Phase.

Figure 1 depicts the decision flow for the programming phase. The work accomplished in this phase starts the MCP process with responsibility falling to the MAJCOM "for developing data for all projects located at their installations, including those for tenants" (6:31). The MAJCOM delegates this responsibility to the base which initiates the formal paperwork and relies on the using agency or the "Host and tenant commands . . . to cooperate fully in developing the data required" (6:31). The data compiled will include such items as facility type, size, justification, cost, siting etc. (6:31-33).

The base usually identifies projects using inputs from the organization which will eventually be responsible for the facility (the user) but may also receive requirements

the structure of the process and finally, their assessment of the overall performance of the MCP. The focus of this study was to identify, categorize and determine the statistical significance of perceptions in these general areas, subject to the following limitations.

Scope and Limitations.

The MCP process is essentially the same throughout the military system but the APRCE function is incorporated as part of the MAJCOM in the overseas theater. Specifically, AFR 88-18 states that "outside CONUS [Continental United States] where no separate APRCE office is established, APRCE responsibilities have been delegated to the MAJCOM," (7:2). Accordingly, this study focused on the problems associated with the three primary APRCE's (Eastern, Central and Western) which together service the CONUS bases and MAJCOMs. Also, due to its large CONUS responsibility, the special Strategic Air Command APRCE was included as part of the population. These decisions to restrict the APRCEs to be examined limited the study to the CONUS bases and MAJCOMs.

The research was further limited to an exploratory investigation of the MCP process for problems most likely to be inhibiting the efficiency of facility acquisition. The inefficiencies identified by the survey respondents are opinions and represent areas for further research, not answers. The intent of this study was to provide results

which will form the basis for future research and solution proposals for specific problems identified.

Finally, data gathering and analysis was performed using a mailed survey and subprograms from an advanced version of the Statistical Package for the Social Sciences (SPSSX). The survey allowed data to be obtained from a wide cross-section of personnel involved with the MCP. The SPSSX package provided the tools which allowed the questionnaire results to be divided into the various management levels and then statistical comparisons of the results performed.

Research Questions.

The analysis of the problem demanded research of four aspects of the MCP process. The areas defined, surveyed and analyzed in this study were Interpretation, Structure, Communication and Performance. Each area is represented by a single research question, as identified below.

Interpretation: Do the players feel confident that the rules and regulations provide enough information, and are current enough for them to effectively understand their job within the MCP?

This research question led to a series of measurement questions designed to explore the perceptions of personnel at each operational level. The measurement questions were designed to determine the degree to which civil engineering personnel understood their responsibilities, within the MCP structure, and the currency of regulations.

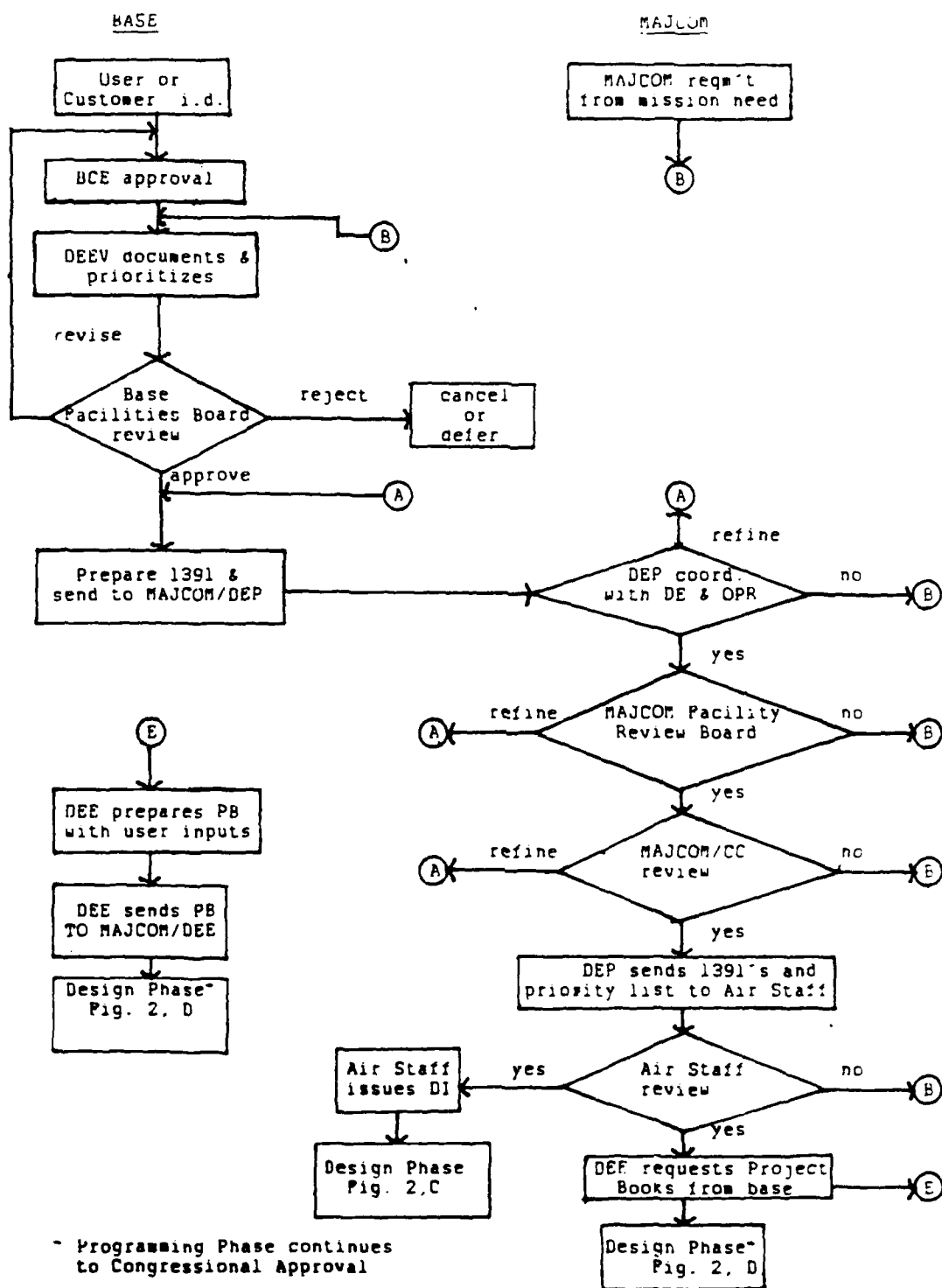


Figure 1. Programming Phase

directly from the MAJCOM based upon mission needs. As identified requirements are reviewed and approved by the Base Civil Engineer (BCE) they are sent to the Environmental and Contract Planning Section (DEEV) (12:2-168). DEEV will be responsible for "project identification, priority designation, classification, [cost] estimation, siting and site waivers, documentation, and coordinating for funding" (12:2-172). Upon receipt of a requirement DEEV begins by assigning the project to a contract programmer.

The programmer "is responsible for preparing the initial documentation . . . and for representing the project before the base facilities board." (12:2-168). The BCE will rely heavily upon the programmer at this point "to understand what will be accepted . . . and how to present the project to get it accepted" (12:2-176) by the base facilities board.

The facilities utilization board (FUB) is comprised of representatives from the various base organizations and chaired by the base commander. They review each project and set priorities for the identified MCP projects (12:2-175). During the FUB review, a project may be terminated due to disagreements among the board members concerning base needs and priorities while those which are incomplete or require additional information will be returned for reworking and future consideration (12:2-175). All other projects are generally approved and prioritized. The MAJCOM identified projects will be inserted into the base priority list by the

facilities board. After the PUB approves a particular project, the DEEV contract programmer will begin preparation of the formal project documentation.

Initially, the host base will prepare the DD Form 1391, "Military Construction Project Data" based upon specific guidance from the MAJCOM (as directed by Headquarters USAF and supplemented by the MAJCOM) (12:2-130). This documentation will provide a brief synopsis of the project, general requirements, the current situation, a discussion of the impact if the facility or renovation is not funded, and a macro-view cost estimate (2:14).

As documentation is completed, the DEEV programmer will forward the 1391s and the prioritized list of required projects to the MAJCOM (12:2-130). The 1391s are received at the MAJCOM program directorate (MAJCOM/DEP), which is responsible for developing the MAJCOM military construction initiatives and conducting base level surveys to identify the needs and requirements to support new weapon systems (12:2-122). More specifically,

The MAJCOM Programming Directorate (DEP) essentially develops and organizes the various programs, calls for projects within the appropriate programs, coordinates the nominated projects with the MAJCOM staff offices concerned (both within and outside of DE [DCS Engineering and Services]), determines the command priorities, solicits approval from the headquarters level required, and tracks the projects through the cycles that apply to their particular program. (12:-127)

The programming actions for each command at this point were summarized in a report prepared for Headquarters USAF:

A typical MCP Form 1391 submission will be suspended to the Requirements Division for review of the validity, scope and conformance with facility criteria; to the Environmental Planning Division for siting and master plan conformance and potential environmental impact assessment; to the Engineering and Construction Directorate [MAJCOM/DEE] for cost estimate, technical adequacy and general scope and design verification; and to the Staff OPR requiring the project for assurance of the correctness of need and user specifications. The base provided information is verified, adjusted or returned for correction and amplification if required. (12:2-130)

Once the reviews are complete the MAJCOM/DEP will submit the proposed MCP projects to the MAJCOM facilities review group, composed of representatives of the major staff elements of the command, for project prioritization (12:2-130). The review group will prioritize the projects considering base level priority assessment, guidance concerning anticipated funding, mission requirements, areas of emphasis of the MAJCOM commander and staff, and the relative needs of the bases when viewed at the headquarters level (12:2-130). The prioritized list of projects will then be submitted to the MAJCOM commander for final refinement and approval (12:2-131).

Once approved, the MAJCOM/DEP will forward the project priority list and 1391s to Headquarters USAF, Engineering and Services (2:39). This is referred to as the phase I, or preliminary submittal, and becomes a part of the total MAJCOM Program Objectives Memorandum (6:31). During Headquarters USAF review of the MCP phase I submittal, each MAJCOM/DEP will monitor the status of projects, obtain and provide

requested information and clarifications, and generally defend the projects until they are canceled or approved (12:2-131).

At Headquarters USAF, the project may either be validated, invalidated, or returned for additional information (12:2-47). If the project is invalidated it will be delayed until the next year. If additional information is required, the project will be cycled through the MAJCOM to the base for clarification. Approval (validation) of a project will result in the issuance of a formal Design Instruction (DI) (12:2-47). For larger projects, the procedures vary in that Congress must be given the opportunity to review the project prior to design.

Title 10, Section 2807 of the U.S. Code requires that Congress specifically approve projects where the expected design cost will exceed \$300,000. (12:2.47)

The DI advises the MAJCOM, the APRCEs, and the bases that design of the project can proceed and specifies the design agent (DA), the authorized design level (usually 35%), the scope, the budget, and any recommended changes to the project (12:2-178). This is the point at which the design and programming phases overlap. Formally the programming phase is not complete until Congressional approval is obtained. This usually occurs after 35% design (12:2-47). The DI actually signals both the beginning of design and the final stages of the programming process. The overlap is structured in this manner because it is "the desire of the

Congress to have design of projects substantially underway prior to requesting authorization and appropriation "

(8:4-3). This requirement ensures that cost and scope are well defined prior to congressional approval, which helps reduce requests for additional funds.

Once the MAJCOM receives the DI, the Directorate of Engineering (MAJCOM/DEE) "calls for, reviews, coordinates, and subsequently forwards Project Books (PBs) to the AFCE, Headquarters USAF and other agencies that require copies." (12:2-134). The PB is the primary means for documenting requirements for design of MCP projects (12:2-189).

The MAJCOM/DEE is responsible for the proper development of the PBs since its primary responsibilities consist of,

providing the guidance and assistance in managing the Command's design and construction projects and for providing the Command's bases with engineering and architectural expertise for the development of methods and criteria as well as reviewing base originated designs. (12:2-131)

The MAJCOM/DEE monitors the PBs and the MCP projects "from initial design through final acceptance . . . maintains contact with the AFCEs and coordinates the use of base level engineering and planning resources." (12:2-133). Acting on this responsibility, the MAJCOM/DEE notifies the base of project approval and calls for the PBs.

PBs are generally prepared by the base engineering section (DEEE) with many functional requirements provided by the using agency. It is not unusual though, for the

base/DEEV section to accomplish the PB as part of their responsibilities (12:2-176).

In order to meet congressionally mandated deadlines, it is important to prepare PBs as quickly as possible. The bases and MAJCOMs may take the initiative and "frequently PBs have already been generated, reviewed and need only updating by the time USAF issues the formal DI" (12:2-136). This parallel development of the PB with the 1391 submittal allows

the initiation of the PB development for HQ USAF supported projects in sufficient time to allow preparation of a quality PB and accomplishment of advanced design prior to Congressional presentation. (8:6-1)

The purpose of the PB is to describe facility requirements based upon inputs from experts around the base and, most importantly, the facility user. It contains data, criteria, functional requirements, and cost information to support programming and design of facility projects and is designed primarily for the use of Headquarters USAF, the responsible AFPRCE, and the design agent (DA) (8:6-1 to 6-2). This information may include

a project description summary; site description; special considerations; structural, electrical, and mechanical requirements; project cost estimates and cost justification calculation; air conditioning load and other utility needs; and an energy impact statement. (12:2-178)

In addition, the PB must also include an AF Form 1178, Abbreviated Cost Estimate and an Economic Analysis (12:2-178). Finally, to ensure accuracy, the project book must be formally coordinated at the base with the using

agency, Communications Officer, Fire Chief, Safety Officer, Base Civil Engineer, and Base commander prior to submittal to the MAJCOM for approval (2:14). Considering the requirements and coordination necessary to complete a project book the process is extremely time consuming. It is not unusual for a properly prepared project book to require three months for preparation (12:2-190).

When the MAJCOM/DEE receives the PB, an extensive review process begins. The review is designed to "ensure that the project cost estimate is valid and that all applicable criteria and unusual requirements have been considered" (8:6-5). The PBs

are evaluated by the DEE specialists, including civil, structural, mechanical, electrical and architectural, as appropriate for the particular project. Coordination of fire, safety and maintainability aspects are secured from . . . others as required. base planning and environmental considerations are assessed by the environmental planning personnel. Facility requirements and real estate assessment on the validity, criteria conformance and potential acquisition implication are solicited. Staff OPRs . . . are suspended for user-oriented observations. (12:2-137)

Finally, the MAJCOM/DEE project manager will prepare Tab N to the PB. This Tab summarizes the review comments, and verifies consistency between the 1391, the 1178 and the DI in regards to title, scope and cost estimate (12:2-137). This package is then forwarded to the AFPRCE Headquarters USAF and others as required (12:2-137). This is the phase II submittal and becomes the basis for the budget estimate submittal to the Secretary of Defense (6:31).

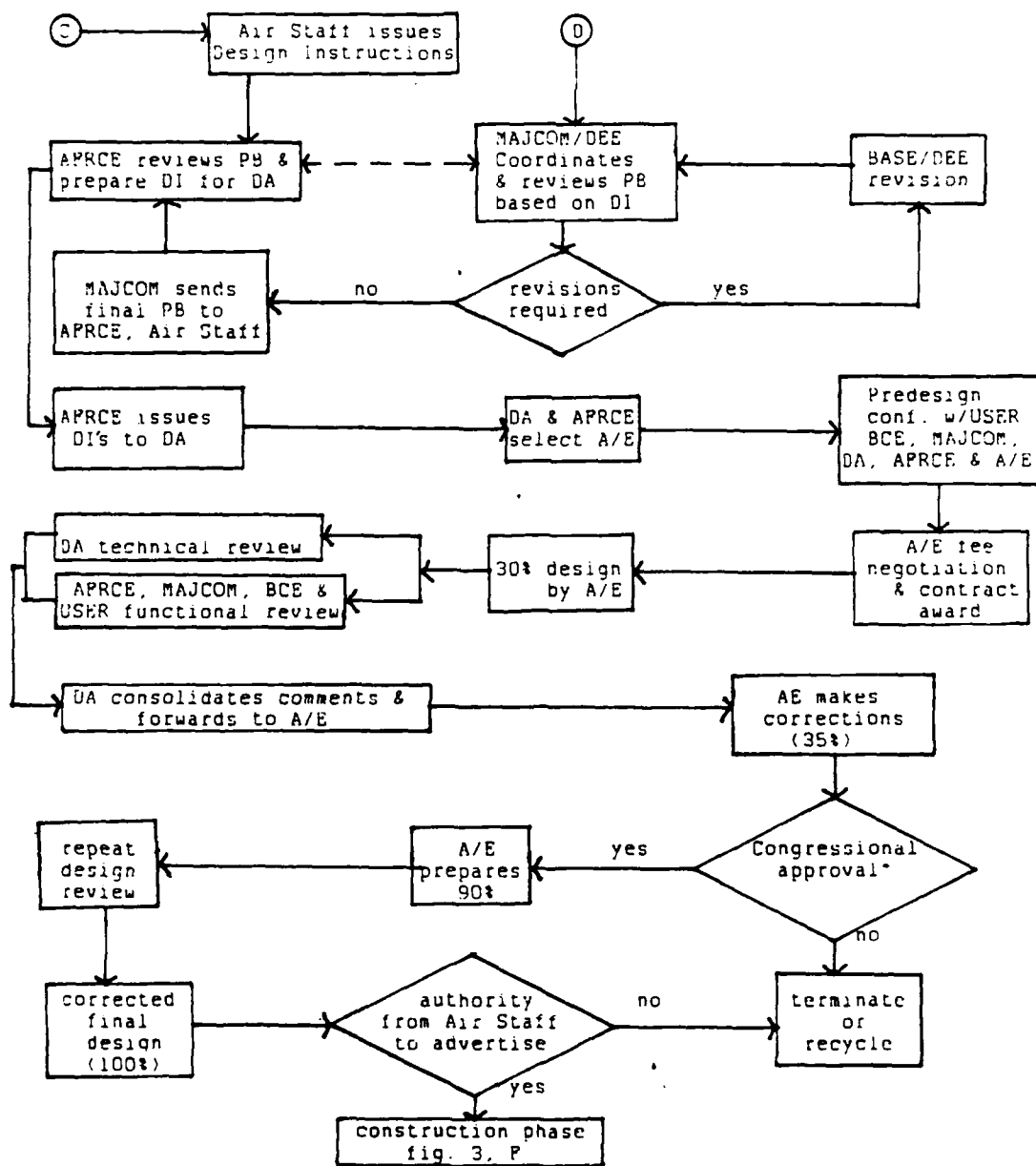
Headquarters USAF reviews the submittals from the MAJCOMs and selects the projects to be forwarded for Office of the Secretary of Defense and congressional review, approval, and funding (13:24). This is accomplished by preparing an expanded form of the 1391 which is forwarded to the Office of the Secretary of Defense (OSD) for approval and then simplified for incorporation into the Congressional Briefing Booklet for final congressional approval (12:2-179). When the "project is Congressionally approved, the contract planners activities are completed" (12:2-179) and the APRCE and MAJCOM are provided authorization to proceed to the final project design.

Design Phase.

The functions of this phase are best summarized by Hansen when he states that:

The design effort involves extensive cooperation, coordination, and review by all interested and affected parties. This includes the user, the MAJCOM, the APRCE, the base and the design agent, and involves extensive reviews at specific stages of design as specified in AFR 89-1. This close and detailed involvement in the design stage is intended to insure a minimum of design changes and maximize effectiveness for the using organization. (13:26)

Figure 2 depicts the decision flow of the MCP design phase described by Hansen. The design phase begins when Headquarters USAF issues design instructions (DIs) to the APRCE and the MAJCOM (13:24-25). The first DI issued will provide specific guidance concerning scope, cost limitations,



* The AP may fund and design up to 100%, without the final approval of Congress.

Figure 2. Design Phase

design, and policy (8:4-3). "Subsequent Design directives [will] authorize design of specific projects and identify the APRCE, design agent, and construction agent for each MCP line item" (8:4-3).

Once the APRCE receives the DI for a specific project it "begins to become involved in the design and construction of the MCP facility" (12:2-100). The APRCEs responsibility from this point on will be "the timely, economical, and efficient management of the design and construction" (21). The construction responsibilities are incurred during the construction phase while the APRCE design responsibility, is to "maintain . . . scope and programmed amount of assigned projects and assure that design conforms to these restrictions" (22). To effectively accomplish these tasks, the APRCE will appoint a project manager who will coordinate a thorough APRCE review of the PB (12:2-100). The main objective of the APRCE review will be to assure both the adequacy of the design criteria and the cost estimate (7:3).

When the MAJCOMs copy of the DI arrives, it will be forwarded to the MAJCOM/DEE which "calls for, reviews and coordinates, and subsequently forwards Project Books (PBs) to the APRCE, Headquarters USAF and other agencies" (12:2-134). This review/coordination process will further refine the PB with the base primarily responsible for revisions.

When the APRCE receives the PB, the project manager will begin to prepare the final design instructions (DI) for the

Design Agent (DA) (22). The DI will specify the DA, as the Army Corps of Engineers, the Navy Facilities Engineering Command, a civilian architect-engineer firm (15:23), or the Air Force. To ensure close coordination between the DAs and the AFRCE, they are "collocated with the . . . District US Army Corps of Engineer (COE) or Naval Facilities Engineering Command" (7:2). This arrangement is required since the AFRCEs direct the design efforts through the DA, "which then contracts and monitors the Architect Engineer (A/E) awarded the contract." (12:2-171).

The DA will begin selection of an A/E by preparing "the preliminary design schedule and the synopsis for the Commerce Business Daily (CBD)" (12:2-100) based on PB and information provided by the AFRCE. The CBD synopsis constitutes the formal advertisement for an A/E and will generally result in responses from interested A/Es. The A/Es will be considered for selection by first, a preselection board and then a selection board which are chaired by both the AFRCE and the DA (12:1-100). The purpose of these boards is to prioritize and list the most qualified A/Es (12:2-100). The top A/E will be selected to attend a predesign conference. (12:2-100).

The predesign conference will include representatives from the AFRCE, DA, BCE, MAJCOM, user, and the A/E. This conference is intended to allow a detailed review of the revised PB, site conditions, and additional criteria which

may have been overlooked (12:2-100). This information will be used by the DA to prepare a fee proposal which will be negotiated with the AFRCE and the DA (12:2-100). When a mutually agreeable fee is approved by all parties the contract may be awarded to the A/E and the Notice to Proceed (NTP) issued (12:2-100). At this point the A/E is authorized to proceed to 30% design (2:15).

The authorization to 30% reflects the beginning of the concept design phase which is followed by the final design phase (12:2-100). The concept design represents the design to the 35% (30% design plus corrections) level. Information from the 35% design will be submitted for congressional project approval. The final design will start after congressional approval and proceed to completion of the final design (12:2-100 to 2-101). In the interest of expedience, final design may start prior to congressional approval but design costs beyond 35% will be absorbed by the Air Force if approval is not granted.

Once the A/E submits the 30% design, the Air Force requires a technical review and a functional review, which should occur concurrently, "so that changes will not be required after award" (8:12-3). The technical review will be accomplished by the DA and will consider the technical adequacy of the structure, and any special technical requirements. The AFRCE, the MAJCOM, and the base will be responsible for the functional review (12:2-100). The

functional review considers work area arrangement, special requirements related to the mission, and economical maintenance and operation (8:7-4). The APRCE will oversee the functional review and must consider complicating factors such as the number of reviews, adherence to Air Force criteria, established design completion dates, the possibility of cost increases, and, if major discrepancies are found during the review, the determination to stop or continue design (8:4-4, 7-4).

The APRCE will forward coordinated APRCE, MAJCOM, and base functional comments to the DA. The DA will combine these functional comments with their technical review comments and forward the total package to the A/E for incorporation (12:2-100). Where disagreements exist between the APRCE and the DA, the APRCE will have final authority and may direct the DA to incorporate disputed comments. Once the review process is complete and comments are incorporated by the A/E, the design is considered to be 35 percent complete and the A/E must wait for further approval from Headquarters USAF to proceed further (2:15).

The 35 percent design point marks the entry of Congress into the MCP design process. Generally, Headquarters USAF wants Congress to consider the project while simultaneously continuing design, possibly to completion (13:26).

All submittals after the 30% review will require the same functional and technical review, with comments submitted

to the A/E for incorporation into the design (12:2-101). The final formal submittal will be the 90% design which is limited to ensuring that functional and technical requirements related to operations are in accordance with approved preliminaries (8:7-5). After the A/E makes the required changes, the DA will formally accept the project design as 95% complete and the APRCE will report the project as ready to advertise and submit it to Headquarters USAF for approval (12:2-101).

When Headquarters USAF authorizes advertisement of the project, the APRCE will notify the DA which will authorize the A/E to prepare the final bidding documents. Completion of this task will represent the 100% design (12:2-101). Upon Headquarters USAF approval, the construction phase of the MCP begins.

Construction Phase.

The decision flow for the construction phase is shown in Figure 3. This phase begins after Congress has approved, authorized, and funded the MCP project, and Headquarters USAF has provided authorization to the APRCE to advertise (2:16). The APRCE's tasking during advertisement and final award of the project is to "Be fully abreast of current HQ [Headquarters] USAF policy and restrictions on funding, advertising and award of projects" (22). This tasking will include the responsibility to "Monitor advertisement and exercise authority to request that [the] construction agent

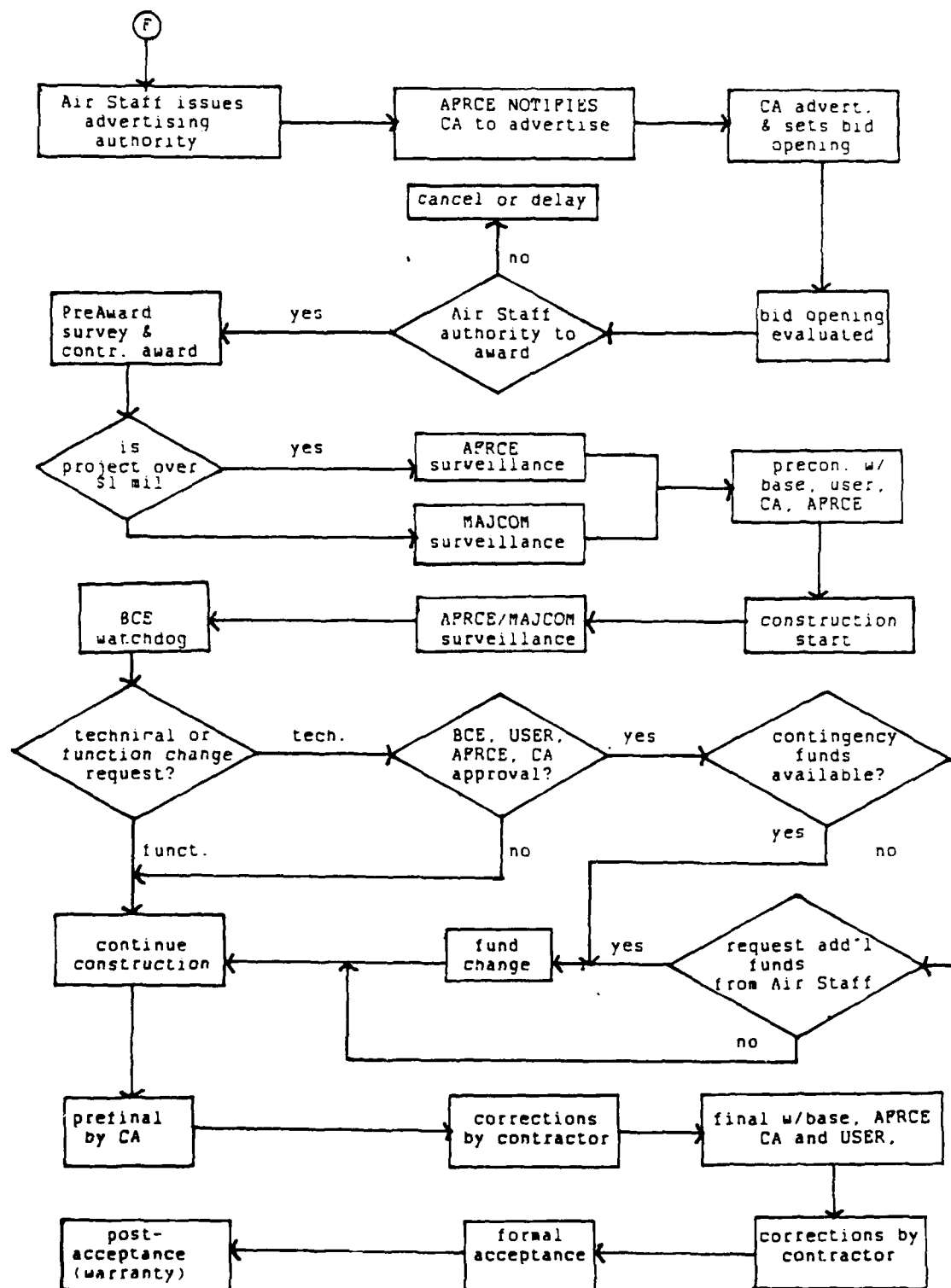


Figure 3. Construction Phase

defer, readvertise, and/or postpone bid opening" (7:3) as required in the best interests of the government.

Upon approval to advertise a project, the AFRCE notifies the DA and the Construction Agent (CA). The CA and DA in most cases will be the same agency (Army, Navy or Air Force), but are discussed separately, since the responsibilities of the DA and the CA are distinctly different. The DA is directed to prepare the final specifications and bid package for advertisement by the CA (12:2-101). As the DA completes the bid package, the CA is notified to prepare for project advertisement and to advertise an Invitation For Bids (IPB) in the Commerce Business Daily (CBD) (12:2-101). The CBD advertisement is the first step of the formal advertising procedure and provides prospective contractors with a synopsis of the project (12:1-101). Finally, as the bid documents are completed the CA will set a bid opening date and distribute an IPB to interested contractors (13:26). Copies of the IPB will be sent to the AFRCE and the MAJCOM for their information (8:7-5).

"As soon as bid opening data are available . . . AFRCE/MAJCOM forwards the data to HQ USAF" (8:4-6) requesting authority to award the contract. This notification includes the Current Working Estimate (CWE), which is the lowest acceptable bid received by the CA (8:4-6). If the lowest bid is above the authorized funding level, the AFRCE may coordinate and approve deferral of lower priority MCP items

to make sufficient funds available for award of contracts for higher priority items (7:4). The APRCE revised estimate will then be submitted to Headquarters USAF as the CWE. Final Headquarters USAF approval will generally follow an APRCE pre-award survey of the contractor's capability to satisfactorily perform the work (12:2-101).

Once the APRCE receives Headquarters USAF authorization to award the contract, the project manager will formally "provide the construction agency with Air Force approval of current working estimates for acceptance of bids" (7:3) and the CA will award the contract. It is customary that "An information copy of the APRCE authority to award letter goes to the BCE [Base Civil Engineer]" (12:2-216).

Following the award, construction surveillance will be delegated to the MAJCOM for projects under \$1 million, otherwise the APRCE project manager will maintain complete responsibility (12:2-101). Specific Construction Management responsibility, whether it is performed by the Army, the Navy, the APRCE, or the MAJCOM, acting as the CA, is to "provide construction surveillance, funds management, coordination, control of cost growth, and expeditious transfer and acceptance of completed construction" (8:12-2). Generally, the Army or the Navy will provide the direct construction management under the direction of the APRCE; while, the MAJCOM will monitor the project and provide functional direction and expertise as required. The base

will more closely monitor the project for functional adequacy and provide support to the contractor as required. These varied responsibilities begin following the pre-construction conference.

After the contract is awarded, a "pre-construction conference will be held to acquaint the contractor with any constraints that must be met concerning site access, material storage, and other preliminary information" (13:26). Typically the CA, AFRCE, BCE, and contractor will attend the pre-construction conference (12:2-101). The BCE representative to the conference, generally from the construction management section (base/DEEC), discharges the majority of the the BCE and MAJCOM responsibilities (8:12-3). The representative will ensure that "all necessary coordinations are made for rapid contractor mobilization and start of construction" (8:12-3) and that the "completed facility will be functionally usable for the programmed purpose, and that it can be economically maintained" (8:12-3).

After the pre-construction conference, the contractor will begin construction under the surveillance of the CA (22). The AFRCE responsibility is to "coordinate with the construction agent" (12:2-171) and to maintain "construction . . . surveillance inspections as required" (22) to ensure proper construction. The MAJCOM/DEE role will consist of oversight responsibility for such aspects of the project as

construction surveillance (which is often delegated to the base), funds management, coordination, control of cost growth, and expediting the transfer and acceptance of completed construction (8:12-2).

In addition, "A prime responsibility of the major command and the APRCE is to minimize cost growth of MCP projects during construction" (8:12-2). To accomplish this, the APRCE is given the responsibility to review and approve all contract change requests which result from changed or unforeseen conditions, or development of new requirements during the course of the contract (8:12-1). To accomplish cost control, contract modifications are highly discouraged and as a general rule "Only those proposed changes that are mandatory and must be accomplished for the project to function as intended" (8:12-4) will be approved.

Once a change has been identified, the CA must notify the APRCE project manager, who may request additional funds from Headquarters USAF (12:2-71) or make "Changes within the programmed amount . . . without Headquarters USAF approval" (12:2-71). "Thus, if the change is within the programmed amount, then the APRCE simply sends a message directly to . . . [Headquarters USAF] stating that additional funds are required" (12:2-71).

If funding authority exceeds the programmed amount, Headquarters USAF has the authority to approve increases up to 15% of the programmed amount but not over \$1 million (1).

If the cost of the change is above Headquarters USAF approval authority, "The Secretary [of Defense] can approve changes between the \$1 and \$2 million dollar level provided the amount does not exceed the programmed amount by . . . [15%]; any change above . . . [15%] must be submitted to Congress" (12:2-71). During the course of any change request, the contractor will continue construction unless the APRCE or the CA determine that work should stop until the change is approved.

Acceptance of the project consists of two steps. First, a prefinal inspection will be scheduled to identify deficiencies for corrective action. Specifically,

"The CM and the project inspector, accompanied by the contractor, should inspect the job thoroughly for all deficiencies several days before the expected completion date. The CM should look not only for the stated result required from the plans and specification, but also for the small details that can delay the acceptance of a project and cause the Air Force undue operations and maintenance costs. A list of deficiencies should be made and copies furnished . . . the BCE and the contractor. The contractor should correct all items and then, with the CM and the project inspector, thoroughly reinspect the project. This may have to be repeated several times. When the CM is satisfied that all items are correct, he should proceed with the final inspection." (8:14-3 to 14-4)

Second, a final inspection is scheduled after the contractor has declared his work to be finished (8:14-4). This inspection will generally include representatives from the APRCE and MAJCOM, depending upon the size and scope of the project and its relative importance. Representatives from the BCE, the using agency, the contractor, and the construction agency are required to attend (8:14-2). Also,

manufacturers' representatives, operations and maintenance personnel, and other interested personnel required to maintain the facility must be available to receive contractor briefings on facility maintenance and operation (8:14-4). When the final inspection is completed and identified deficiencies are corrected, the Air Force will assume responsibility and accountability for the facility (13:27).

Often, in more complex or urgent projects, the Air Force may accept a partially completed facility (joint occupancy) to meet specific need dates (1). It is the Air Force policy to minimize joint occupancy agreements with the contractor, preferring instead to accept a completed facility with only minor discrepancies (8:14-1). Upon final acceptance, the project, except for warranty issues, is inactive (12:2-169).

Generally, the MCP process is completed at the final acceptance of the project by the Air Force; but on larger projects, a post-acceptance (post construction) inspection may be held just prior to warranty expiration, about eleven months after acceptance (12:2-102). "The purpose of this post construction inspection is to ensure that the facility is meeting its intended requirement and . . . [that] all warranty items are functioning properly" (12:2-102). According to regulation, the post-acceptance inspections should identify latent design or functional deficiencies that were not discovered during the original facility acceptance for incorporation into future designs (8:14-5).

III. Methodology

Chapter Overview

The analysis of the problem presented in Chapter 1 required a carefully prepared plan or methodology. The methodology decided upon included the use of a carefully created, distributed, and analyzed survey instrument. The justification for this approach is discussed, followed by a further discussion of the survey instrument used and its contents. A complete description of the population and the sampling methods used are then reviewed, which leads to the method employed to administer and collect data from the sample. Finally, an explanation of the statistical tests employed to analyze the data are provided.

Survey Justification

To obtain the data necessary to answer the research questions posed in Chapter 1, only two survey techniques were available: Personal interviews (including telephone interviews) and mailed surveys (9:158-176). Capt Larson (larson), using personal and telephone interviews in a thesis concerning the system acquisition process, was only able to make 51 contacts during the same time frame allowed for this study. The small number of contacts made by Capt Larson introduces the possibility of a nonrepresentative sample and a questionable result when the responses of the contacts are analyzed. More valid and reliable results could be generated

by the use of randomized population sampling based upon the science of statistics. This technique allowed generalization of sample information and calculations of the overall reliability but required much larger numbers of respondents to ensure the sample contacted was representative of the population..

To satisfactorily answer the research questions, it was determined that at least 500 respondents would be required. To obtain this amount of data via the personal interview technique would have required travel over the U.S. or extensive and time consuming use of the telephone. Considering the time and cost limitations imposed, the fastest and most efficient means of obtaining such a large amount of research data was the mailed survey.

Survey Instrument

The survey instrument (Appendix A), represented four separate surveys and consists of five sections: The Demographic, General, Programming, Design and Construction sections. Dividing the questions in this manner allowed respondents to answer questions tailored to their area of responsibility in the MCP process. Within each section, the questions were designed to allow analysis of each of the four aspects of the MCP process discussed in Chapter I: Interpretation, Structure, Communication and Performance.

The demographic questions identified each respondent by their organizational level (i.e. base/DEEV, MAJCOM/DEP etc.),

MAJCOM assigned to, AFRCE serviced by, current grade, and experience. These questions provided the information to track the number of respondents from each organizational level and to separate the data into specific groups for analysis. The additional information was required for investigations of confounding variables, such as years of experience.

The general questions dealt with details of the MCP process which were of concern to all of the respondents. These questions addressed items such as clarity of available regulations, overall project review process, effectiveness of communication, sufficiency of authority, training, and adequacy of scope. The programming, design, and construction questions were more specific. They dealt with aspects of the respondents specific job, including the sufficiency of regulations.

The programming questions were asked of those respondents who worked in the programming sections at the base (base/DEEV) and the MAJCOM (MAJCOM/DEP). These questions solicited responses concerning the preparation and review of the 1391s and the Project Books (PBs), the MAJCOM facilities review board, effects of returned projects, and project cycling from year to year.

The design questions allowed responses from the base design engineers (base/DEEE), the MAJCOM design engineers (MAJCOM/DEE), and the AFRCE. These questions covered the MCP

design process, the PB as a design aid to the A/E, the A/E selection process, the Design Agent, the functional review process, and the predesign conference.

The construction questions involved those respondents who answered the design questions in addition to base construction management personnel (base/DEEC). This section of the questionnaire included questions concerning the Construction Agent, APRCE representation of user interests, the preconstruction conference, and the process of identifying construction deficiencies.

Scoring Procedure. A seven point Likert scale, which provides ordinal level data, was chosen for comparing responses to each question. Ordinal data provides information which allows both rank and order to be determined (9:88) and may be analyzed using parametric techniques (14:27). The Likert scale is commonly used to measure attitudes and is most useful when comparing groups of scores (9:256). The scale used was anchored with "strongly agree" rated as one, and ranged to "strongly disagree," rated at seven. The midpoint of the scale was scored as a four and rated as "undecided."

Validity. "Validity refers to the extent to which a test measures what we actually wish to measure" (9:94). It implies the use of "expertise to define a universe of interest, the careful drawing of a representative sample of ideas from this universe, and the preparation of test items

that match these ideas" (18:107). One method used to achieve validity is "to use a panel of persons to judge how well the instrument meets the standards" (9:95). This was the method used in this study. A review process involving experts within the School of Civil Engineering provided the feedback which led to the final questionnaire. Captain Larry Blake (1), who was previously assigned to the special missile AFRCE provided primary feedback while final review of the questionnaire was accomplished by Colonel Marshall Nay, Dean, School of Civil Engineering, and Lieutenant Colonel Alan Tucker, Director, Graduate Engineering Management.

Reliability. Reliability is the degree to which a measure supplies consistent results (9:98) and always contains two components, the true value and some error of measurement, which can be estimated (18:102). An estimate of the reliability of the questionnaire was calculated by the SPSSX statistical package, on the VAX 11/785 Academic Support Computer (ASC). The RELIABILITY subprogram was used to calculate Cronbach's alpha which varies from zero to one depending upon the reliability of the survey instrument (4:49). A value of zero indicates that all variations are due to errors of measurement, while a value of one indicates that no measurement errors occurred (4:49). The following ranges of Cronbachs alpha represent the relative reliability of a survey instrument depending upon the value of alpha (23).

.90 - 1.00	Excellent
.80 - .89	Good (Very common)
.70 - .79	Fair
< .70	Marginal

Population/Sample.

Population. The population was composed of individuals (both military and civilian) familiar with the Military Construction Program. The population was limited to the Continental United States (CONUS) and the three levels of the MCP process discussed in the literature review: The AFRCE, the MAJCOM, and the base. The AFRCE population was further limited to the three AFRCEs responsible for the CONUS MCP (Western, Central and Eastern regions) and Strategic Air Command (SAC) AFRCE. Finally, the MAJCOM population consisted of those individuals from the MAJCOM/DEP and MAJCOM/DEE sections while the base population was defined as those individuals within the base/DEEE, base/DEEC and base/DEEV sections.

Thus, 4 AFRCEs, 9 MAJCOMs and 82 bases were identified as primary users of the MCP system within CONUS. The population figures for each of these organizational levels were obtained through telephone conversations and computer printouts from the Military Personnel Center at Randolph AFB, Texas (19). Each of the AFRCEs and MAJCOMs were called and asked to provide the number of individuals that were experienced with the MCP program within their organization.

TABLE 3.1
Population and Sample Sizes

Location	Population	Sample Size (95% confidence)	Surveys Mailed	Question* Groups
AFRCE	72	61	72	G, D, C
MAJCOM	189	127	189	G
DEP	47	-	47	P
DEE	142	-	142	D, C
BASE	2378	331	509	G
DEEV	186	-	53	P
DEEE	1156	-	253	D, C
DEEE & DEEC	2192	-	457	C

- * The symbols used are:
 G - General questions
 P - Programming questions
 D - Design questions
 C - Construction questions

The base populations were estimated from information provided by the Military Personnel Center. The totals counted are listed in table 3.1 above.

Sample. "The ultimate test of a sample design is how well it represents the characteristics of the population it purports to represent" (9:277). The sample design chosen to represent the population consisted of a combination of total population surveys (a census) and selection of representative

samples of the population (a random sample). Due to the small population of the APRCE and the MAJCOM, a census survey was performed in order to provide the highest confidence in the results. On the other hand, the base population was much too large to census. A random sample of 331 was required to provide a 95% confidence that the sample parameters would be representative of the base population.

Data Collection Plan

The primary source available for identification of survey respondents was the ATLAS data base (10). Unfortunately, this source was not able to identify the individuals in the population needed for this study. Accordingly, supervisors of potential respondents were contacted and asked to distribute questionnaires to the appropriate personnel.

For the APRCE and the MAJCOM populations, the supervisors had already been contacted to determine the population size and were subsequently asked to distribute surveys to their personnel. The base survey packages were mailed to 20 randomly selected civil engineering squadrons in care of the DEE (engineering) section to provide the 331 respondents from the base.

Each survey package contained a letter of explanation which identified the individuals that should receive the survey and requested the aid of the supervisor in distribution. Appendix A contains copies of the letters.

Statistical Tests

Parametric tests were employed in the analysis of the data even though the survey instrument provided only ordinal level data. In recent years this approach has become generally accepted since

"A statistic is completely independent of the numbers on which it operates and is totally unconcerned about the nature of the measurement scales to which the numbers are fitted." (14:27)

Further, it has been shown by

"definitive evidence that statistics calculated on ordinal measurements are just as reliable and meaningful as statistics calculated on interval or ratio scales of measurement." (14:27)

Accordingly, parametric procedures available on the SPSSX package from the Academic Support Computer were used to compare the results of each question from the survey instrument. These procedures were used to determine points at which the perceptions of the populations converged, diverged, or showed no meaningful difference. To test each question, the ONEWAY subprogram of SPSSX was used to compute a oneway analysis of variance (ANOVA) using an alpha value of .05 or a 95% confidence that the null hypothesis was rejected when the means of the responses were indeed different. The null hypothesis that the oneway ANOVA procedure tested was that there was no significant difference between the mean score of each group of respondents (gilbreath:331-332). The results of this analysis revealed which groups answered in the same manner for each question tested and which groups

differed in their mean response to each question.

The oneway ANOVA procedure was chosen because it provides an "extremely flexible procedure for determining the factors that influence the variation of the dependent variable" (18:231) and is a very powerful statistical test (18:236). This procedure requires that the data "must come from (1) independent random samples from (2) normally distributed and (3) equally variable populations with (4) equal means" (18:232). When any of these assumptions are violated the null hypothesis is rejected (18:236). Accordingly, by controlling the first three assumptions, a conclusion that the means are not equal will be assured.

The first two assumptions of independent random samples from normally distributed populations are controlled by employing the sampling plan previously discussed. The samples were taken from separate populations and therefore are independent. They were randomly chosen and the calculated size of the samples allows for the "benefits of the central limit theorem" (18:236) to assure normality. The third requirement was controlled by examination of the Bartlett-Box F, calculated by the ONEWAY subprogram. This test requires only three or more independent estimates of variance, provided by the samples, to test for equality of variance (3).

The ONEWAY subprogram also calculated a 95% confidence interval for the mean of each group and the total mean of all

groups. The confidence interval in this case represents the interval which will contain the true value of the mean 95% of the time. Accordingly, if the confidence interval from the total population contained the value of four (representing "undecided") the question was ignored as a valid indication of opinion. If the confidence interval did not contain the value of four the answer was skewed to either "strongly agree" or "strongly disagree" and the question was considered to be a valid indication of opinion and was included in the discussion of results.

Finally, if differences between the means were detected, the oneway ANOVA test could not determine which group differed, so the Scheffe procedure was used. The Scheffe procedure tests all possible comparisons between means (18:239) and was available through the RANGES command of the ONEWAY subprogram.

IV. Results

Chapter Overview

The results of the survey are presented in this chapter. First, a discussion of the effect of the return rate upon the statistical significance of the results is provided. Next, the reliability of each of the four subsections of the questionnaire is discussed. The last sections cover the four research questions, presenting the results of the survey as it pertains to each research question, and concludes with a discussion of three open-ended questions asked of those surveyed.

Descriptive Statistics

Table 4.1 details the return rates of the 770 surveys mailed. The return rates for the APRCE, the MAJCOM and the base populations were very good. Since the APRCE and the MAJCOM were surveyed by census, their return rates of 72% and 53% respectively represent a very high confidence level. However, the return rate for the base was only 29%. This low return rate for the base caused concern, but the reliability of the results were considered to be just as good as that of the APRCE and MAJCOM rates. "Mail surveys with a return of 30 percent or so are often considered satisfactory" (9:172). A 65% or better return would have statistically verified a 95% confidence level (confidence in the ability to generalize the results) that was desired for this study. The

TABLE 4.1
Data Return

Location	Population	Surveys Mailed	Percent Returned	Confidence level (%)
APRCE	72	72	72	Census
MAJCOM	189	189	53	Census
DEP	47	47	45	-
DEE	142	142	56	-
BASE	2378	509	29	80
DEEV	186	52	63	-
DEEE	1156	253	35	-
DEEE & DEEC	2192	457	26	-
TOTAL		770	45*	-

* Includes 39 surveys returned blank.

80% confidence level obtained for the base is adequate, but for several reasons it probably was much higher than the calculations show.

There were at least two identifiable reasons for the low survey return rate. First, the subject currently seems to be very sensitive. Three studies relating to the MCP, two commissioned by and the last approved by Headquarters USAF have occurred within the last two years. An indication of

this was that five surveys, totally blank, were returned from just one of the surveyed bases. Another seven unidentified surveys were returned blank. Possibly, the respondents are tired of inquisitions concerning the MCP. Second, at least two different surveys concerning other subjects have been sent to the same respondents. They may be tired of filling out surveys.

The first indication of the low response came when two bases returned approximately 27 blank surveys, explaining that they were extra and not needed. After three weeks of poor response each of the twenty bases was telephoned. This effort indicated that the base population had been overestimated. The information from the Military Personnel Center did not accurately define the population. Also, some supervisors explained that they had distributed the surveys only to those individuals who were experienced with the MCP program. One base distributed the surveys only to individuals assigned to a special "Major Construction" unit. These combined facts indicate that the sample was much smaller than originally estimated.

Since the sample size was smaller than expected, it can be logically assumed that the population was also overestimated and as a result the confidence level underestimated. This follows directly from the fact that, as the population decreases, the sample size for a 95% confidence level will also decrease. Thus, the actual

confidence level was probably much better than the 80% calculated, but how much better could not be determined without an accurate assessment of the actual population size. Finally, confidence in the quality of the base responses was boosted because the supervisors narrowed the distribution of surveys from the base/DEE population, to the "experts" on the MCP process. Therefore, a 95% confidence level was assumed for the base responses also.

Questionnaire Reliability

The survey consisted of four separate questionnaires which measured the perceptions of 1) all sample personnel 2) programming personnel, 3) design personnel, and 4) construction personnel. Table 4.2 lists the coefficient of reliability, or Chronbach's alpha, for each of the survey instruments administered to the four groups of personnel surveyed.

The reliability of the survey was generally very good except for that of the programming questions. According to the reliability scale presented in chapter III the general questions, with an alpha value of .7113, provided a fair measure of perception, while the design and construction questions are very good. The alpha value of .6149 for the programming questions indicates that their reliability is marginal, most likely due to the small number of respondents. Cronbach's alpha relies on an investigation of sample standard deviations which are sensitive to small populations.

TABLE 4.2
Questionnaire Reliability

Question Group	Questions	Reliability Coefficient
General	1 to 22	.7113
Programming	23 to 43	.6149
Design	34 to 47	.8460
Construction	48 to 58	.8366

With larger sample sizes, the reliability might have increased. Discussions with Dr. Guy Shane, from the School of Systems and Logistics indicate that this value still represents a good reliability (20). Respondent error is the primary cause of large standard deviations and not errors in the survey instrument itself (20). Therefore, the programming questions were considered to provide at least a fair measure of perception.

Research Question Results

The questionnaire was administered to determine the answers to the four research questions from chapter I. The first six questions of the questionnaire identified the respondents. These questions provided data concerning return rates and served to categorize the respondents by management level, for analysis of questions 7 to 58. In this section, Questions 7 to 58 are ordered by the research question which they were designed to answer and the results of the analysis

are presented and discussed. The last part of this section will present the results of question 59 to 61, the open-ended questions.

The results of the ANOVA and SCHEPPE test for questions 7 to 58 are shown in tables 4.3 to 4.6. A fictional example, for discussion purposes, is presented below:

Question	Total Mean	Opinion Differences	95% Confidence Interval	95% Significance
92	3.63	None	3.16 - 4.09	NO
96	3.55	A vs M & B	3.35 - 3.74	YES

The total mean represents the average of all of the respondents answers for a particular question. The total mean is considered to be significant only if the 95% confidence interval for the mean does not include the scale value of four which represents "undecided." For example, the "NO" in the "95% Significance" column for question 92, clearly shows that the question is not significant. Four is contained in the 95% confidence interval shown. The "YES" for question 96 shows that the question is significant. Four is not contained in the 95% confidence interval.

As a result of this analysis there is one confusing factor that must be understood clearly to evaluate the results. Even though the total mean for question 92 is larger than the total mean for question 96, the spread of answers for question 92 was much greater, as indicated by the

larger 95% confidence interval. Accordingly, even though 3.63 seems more significant, since it is larger than 3.55, it is not. The results for question 96 are more significant, because the range of answers were much more confined, as indicated by the tight 95% confidence interval. Thus, 3.55 indicates slightly agree on question 96, and the 3.63 for question 92 indicates undecided, even though 3.63 is larger than 3.55.

The ANOVA test was used to determine the probability of differences between the means and was calculated for each of the three populations. The SCHEFFE test was used to find where the differences, if any, existed. The "Opinion differences" column indicates where differences exist or that no differences exist between the means, at a 95% level of confidence. In the example, question 92 shows no differences in opinions between the populations. The results for question 96 show that differences in opinion did exist and that the APRCE did not agree with the opinion of the MAJCOM or the base.

The following discussion, of the four research questions and each related measurement question, presents the results obtained using the decision rules discussed above and the results of an SPSSX analysis by the ANOVA and RELIABILITY subprograms. The questionnaire number of each measurement question is provided for easy referral to the tables. The

seven point Likert scale used by the respondents was as follows.

STRONGLY AGREE	AGREE	SLIGHTLY AGREE	UNDECIDED	SLIGHTLY DISAGREE	DIS- AGREE	STRONGLY DISAGREE
1	2	3	4	5	6	7
:	:	:	:	:	:	:

The discussion of the survey questions will be presented in terms of the scale values.

Research Question #1. Do the players feel confident that the rules and regulations provide enough information, and are current enough for them to effectively understand their job within the MCP?

This research question was designed to explore the perceptions of personnel at each operational level concerning regulations and operating procedures. The results indicate how well the roles and responsibilities of the MCP players are defined. Table 4.3 provides the results of the questions used in this section.

The following questions are taken from the general section of the questionnaire.

Survey Question 7. The available regulations, procedures, pamphlets and guidance clearly define the responsibility, authority and accountability of the APRCE in the MCP process.

With a total mean of 3.43 and a confidence interval that does not include 4 (undecided) the conclusion is significant. There is slight agreement by the total population that the APRCE's role is clearly defined. It was not expected that the APRCE results would show agreement with a mean value of 2.79, while the MAJCOM and base results would show only

TABLE 4.3

Research Question #1
Results of the Interpretation Questions

Question	Total Mean	Opinion Differences	95% Confidence Interval	95% Significance
7	3.43	A vs M & B	3.25 - 3.61	YES
8	3.31	None	3.14 - 3.49	YES
9	3.27	None	3.11 - 3.44	YES
23	5.21	None	4.74 - 5.60	YES
24	5.06	None	4.61 - 5.51	YES
25	3.27	None	2.80 - 3.74	YES
34	4.00	None	3.79 - 4.21	NO
35	4.70	A vs B	4.47 - 4.93	YES
36	3.80	None	3.63 - 3.97	YES
37	3.92	A vs B	3.74 - 4.10	NO
38	3.47	None	3.28 - 3.65	YES
48	3.25	None	3.04 - 3.42	YES
49	3.79	B vs A & M	3.59 - 3.99	YES

The symbols used represent the following:

A: APRCE
M: MAJCOM
B: BASE

slight agreement. Apparently the APRCE is sure of their role in the MCP process while the MAJCOM and the base are not as certain of the APRCE's role.

Survey Question 8. The available regulations, procedures, pamphlets and guidance clearly define the responsibility, authority and accountability of the MAJCOM in the MCP process.

There is agreement among the management levels with this statement. The total mean of 3.31 provides an indication of only slight agreement, though. The regulations defining the MAJCOMs role in the MCP process are apparently adequate.

Survey Question 9. The available regulations, procedures, pamphlets and guidance clearly define the responsibility, authority and accountability of the base in the MCP process.

There is also agreement across the three populations concerning this statement. The total mean of 3.27 indicates only slight agreement that the base regulations adequately define their role in the MCP process. This value represents the largest indication of agreement of questions 7, 8 and 9.

The following questions are those answered by the MAJCOM and the base in the programming section of the questionnaire.

Survey Question 23. APM 86-2, Standard Facility Requirements, is current and useful.

Both the base and the MAJCOM disagree with this statement. They feel that APM 86-2 is not current and useful based on a scale total mean of 5.21. This is a very significant result considering that answers ranged from two to seven and that a total mean value of five or more was very rare. No respondents strongly agreed with this statement.

Survey Question 24. APM 88-2, Definitive Designs of Air Force Structures, is current and useful.

There are no differences in opinion between the base and MAJCOM concerning this statement. Both feel that APM 88-2 is not current and useful based on a scale total mean of 5.06. The MAJCOM responses ranged from three to seven while the base responses ranged from two to seven. No respondent from the MAJCOM was willing to more than slightly agree to this statement.

Survey Question 25. APR 86-1, Programming Civil Engineer Resources, is current and useful.

Although the total mean of 3.27 indicates slight agreement, the MAJCOM and base differed in their opinions of this statement. The base agreed that APR 86-1 was current and useful, with a mean of 2.81 while the MAJCOM was undecided, with a mean of 3.95. Apparently, the total mean of 3.27 was skewed by the stronger opinion of the base over that of the MAJCOM.

The following questions were taken from the design section of the questionnaire.

Survey Question 34. APM 86-2, Standard Facility Requirements, is current and useful.

All levels agreed that they were undecided. With a total mean of 4.00 and no significant differences in opinion the only indication is that the populations can not decide about the status of APM 86-2. The range of answers, at all levels, were from two to seven which indicates a leaning towards slight disagreement, but not significantly.

Survey Question 35. APM 88-2, Definitive Designs of Air Force Structures, is current and useful.

The total mean was 4.70 for this statement which indicates a slight disagreement. The base mean of 4.23 did differ significantly from the AFRCE mean of 5.32. The base mean was not significant though, and indicated a response of undecided while the AFRCE mean represented disagreement. Overall the total population slightly disagrees that APM 88-2 is current and useful.

Survey Question 36. AFR 88-3, New Construction (Air Force Contract Construction), is current and useful.

There was no disagreement between the levels for this statement. The total mean of 3.80 proved to be significant and indicated slight agreement that AFR 88-3 is current and useful.

Survey Question 37. AFR 88-18, Air Force Regional Civil Engineers, is current and useful.

There was disagreement between the AFRCE and the base in their opinions concerning this statement. The base, with a mean of 3.60, slightly agreed with this statement while the AFRCE, with a mean of 4.36 was undecided. The MAJCOM was also undecided but their opinion was not significantly different from the base. The results for this question were inconclusive, showing only that the total population could not agree concerning the currency and usefulness of AFR 88-18.

Survey Question 38. AFR 88-31, Selecting A&E Firms, is current and useful.

No significant disagreement was evident between opinions of this statement. The total mean of 3.47 was significant

and showed a slight agreement that APR 88-31 is current and useful.

The following questions were taken from the construction section of the questionnaire.

Survey Question 48. APM 88-15, Criteria and Standards of Air Force Construction, is current and useful.

All levels slightly agreed with this statement which proved to be significant. The total mean of 3.25 indicated slight agreement that APM 88-15 is current and useful without any anomalies.

Survey Question 49. APR 89-1, Design and Construction Management, is current and useful.

The base did not agree with either the APRCE or the MAJCOM concerning this statement even though the results were significant. The base, with a mean of 3.24 slightly agreed while the MAJCOM, with a mean of 4.05 remained undecided, and the APRCE with a mean of 4.54 slightly disagreed. The total mean of 3.79 indicated that the total population slightly agreed that APR 89-1 is still current and useful.

Summary. The APRCE, MAJCOM, and the base all slightly agree that the regulations, procedures, pamphlets and guidance clearly define the responsibility, authority and accountability of each management level. The only disagreement was with the currency and usefulness of APM 86-2, Standard Facility Requirements, and APM 88-2, Definitive Designs of Air Force Structures.

Research Question #2. Are the regulations, guidance and procedures effectively providing a structure which allows efficient operation of the MCP?

This research question was designed to determine if the operating structure created by the regulations, procedures, pamphlets, guidance, etc. are adequate and effective. The results indicate how well the existing MCP system operates, according to the perception of the respondents. Table 4.4 provides the results of the questions used in this section.

The following questions were taken from the general section of the questionnaire.

Survey Question 10. The project review process is lengthy and unwieldy and tends to delay projects.

Since the confidence interval for the total mean of 3.49 does not include four (undecided) the results are significant. There is a slight level of agreement that the review process is too long. The results of the ANOVA show no indication of disagreement management level opinions.

Survey Question 20. Changes to projects are accomplished in a timely manner.

The total mean of 4.51 indicates a slight disagreement that changes are accomplished in a timely manner. This result holds across all management levels. No significant differences of opinion were detected.

The following questions are those answered by the MAJCOM and the base in the programming section of the questionnaire.

Survey Question 31. The MAJCOM Facilities Review Board (FRB) effectively performs its function of selecting and prioritizing supportable MCP projects.

TABLE 4.4

Research Question #2
Results of the Structure Questions

Question	Total Mean	Opinion Differences	95% Confidence Interval	95% Significance
10	3.49	None	3.27 - 3.71	YES
20	4.51	None	4.33 - 4.69	YES
31	3.23	None	2.78 - 3.68	YES
33	3.63	None	3.16 - 4.09	NO
39	3.41	A vs M & B	3.20 - 3.61	YES
40	3.89	A vs B	3.66 - 4.11	NO
41	4.21	None	3.98 - 4.43	NO
42	3.02	A vs B	3.38 - 3.84	YES
47	3.75	None	3.55 - 3.94	YES
50	3.29	A vs M & B	3.10 - 3.48	YES
56	3.55	A vs M	3.35 - 3.74	YES
57	3.83	None	3.64 - 4.03	NO
58	2.74	None	2.55 - 2.92	YES

The symbols used represent the following:

A: APRCE
M: MAJCOM
B: BASE

The results of the analysis show a slight agreement that the FRB is functional with no significant difference between the MAJCOM and base opinions. The results were significant with a MAJCOM mean of 2.95 and a base mean of 3.42.

Survey Question 33. Due to the difficulty of meeting deadlines required by OSD and Congress for MCP submittals, many projects are recycled until the following year.

The results of the data analysis for this statement show a strong agreement between the the MAJCOM and the base. The total mean of 3.63 though, is not significant and indicates only that this issue is undecided.

The following questions were taken from the design section of the questionnaire.

Survey Question 39. The MCP design process provides quality MCP facility designs.

The data indicates disagreement between the APRCE results compared to the MAJCOM and the base. The APRCE, with a mean of 2.65 agreed with this statement; while the MAJCOM, with a mean of 3.60, slightly agreed and the base, with a mean of 3.67, remained undecided. The strong opinion of the APRCE coupled with the weaker opinion of the MAJCOM shifted the total mean to 3.41 which provides slight agreement for the total population that the MCP design process does provide quality designs.

Survey Question 40. The PB provides adequate design information for the A/E.

The total mean of 3.89 for this statement indicated that the population was undecided but there were significant differences between the APRCE and the base. The base slightly agreed, with a mean of 3.49, while the APRCE slightly disagreed with a mean of 4.35. The MAJCOM was undecided with a mean of 4.04. The results are not unusual

considering that the base prepares the PB and the AFRCE must interpret the information from the PB for the A/E. It is easy to argue that the AFRCE is in the best position to evaluate the adequacy of the PBs since they deal directly with the design agency which must use the information from the PB. This assumption would lead to a perception that the PB does not support the A/E as well as it should.

Survey Question 41. The A/E selection process assures that the most qualified A/Es are selected.

There was no disagreement between the management levels concerning this statement and no level could decide significantly. The total mean of 4.21 indicates that the total population is undecided as to whether or not the A/E selection process is effective.

Survey Question 42. We are effectively using A/Es to design MCP projects.

There was disagreement between the AFRCE and the base concerning this statement but only in degree of agreement. The AFRCE mean of 3.02 indicates slight agreement while both the MAJCOM, with a mean of 3.68, and the base, with a mean of 3.88, very slightly agree, but not significantly. The MAJCOM and the base are undecided. The total mean of 3.61 provides an indication that the population slightly agrees that A/Es are effectively used to design MCP projects.

Survey Question 47. Functional and maintainability problems are adequately identified during the functional review process.

There was no disagreement between the management levels concerning this question. The means for each level were significantly similar and all below four. The MAJCOM and the APRCE though are undecided and the total mean is skewed by the base to a total mean of 3.75 which indicating that the total population slightly agrees that the functional review process is adequate.

The following questions were answered in the construction section of the questionnaire.

Survey Question 50. The MCP design process provides quality facilities.

All management levels agree with this statement but they disagree as to how well the design process performs. The APRCE, with a mean of 2.51, agrees; while, the MAJCOM and the base only slightly agree, with means of 3.38 and 3.59 respectively. Overall, the lower opinions of the MAJCOM and the base reduce the total mean to 3.29 which indicates only slight agreement that the design process provides quality facilities.

Survey Question 56. Construction deficiencies are adequately identified during the pre-final/final inspection and acceptance.

The APRCE disagreed with the MAJCOM but only in the degree of agreement. The total mean of 3.55 indicated slight agreement that the inspection and acceptance system was able to identify deficiencies. The APRCE, with a mean of 3.04 slightly agreed with the statement. The MAJCOM moved the closest to disagreement with a mean of 3.7, but was

undecided. Overall there were no indications that the construction inspection process is not considered adequate.

Survey Question 57. Remaining deficiencies and warranty problems are adequately identified during the post-final inspection.

The results from this question indicated that the population was undecided. The total mean of 3.83 was not significant and indicated that the total population was unable to decide if the post-final was effectively identifying remaining deficiencies. The base responses ranged from two to seven while the APRCEs ranged from one to six. The base would not strongly agree while the APRCE would not strongly disagree. This result is reasonable when the perspective of each level is examined.

The base deals with the deficiencies that are an inevitable part of construction, even after the warranty inspection. They can not strongly agree that the system adequately finds warranty problems. On the other hand, the APRCE considers the project closed after the post-final and seldom hears additional complaints.

Survey Question 58. Design errors contribute significantly to project delays and change orders.

There is a very good level of agreement that the MCP process does not adequately identify design errors. The total mean of 2.74 is a strong indicator that this is a relatively significant problem.

Summary. The results show that the MAJCOM PRB is functional, the design process provides quality designs and

facilities, A/Es are used effectively and, functional and maintainability problems are identified. The problems indicated were that the project review is lengthy and unwieldy and delays projects, project changes take too long, the base has problems with project book development, and that design errors cause delays and change orders during construction.

Research Question #3. How effective are the informal and formal communications between the players (AFRCE, MAJCOM and base)?

Considering the size and complexity of the MCP, efficient information flow is important to the success of the program. Thus, the communication question was designed to investigate the effectiveness of the established communication system between the three players. The results indicate how well the players communicate between management levels. Table 4.5 provides the results of the questions used in this section.

The following questions were taken from the general section of the questionnaire.

Survey Question 12. I have enough advance notice of project progression through the MCP process to manage projects effectively.

The confidence interval for the total mean of 3.84 contains the value of four (undecided) so the conclusion is that the population is undecided. The total mean is not significant. The individual results show that the base and the MAJCOM, each with means of 4.03, are both undecided, but

TABLE 4.5
Research Question #3
Results of the Communication Questions

Question	Total Mean	Opinion Differences	95% Confidence Interval	95% Significance
12	3.84	A vs M & B	3.63 - 4.03	NO
13	4.34	None	4.16 - 4.53	YES
14	3.62	A vs M & B	3.42 - 3.81	YES
15	3.84	M vs A & B	3.64 - 4.02	NO
16	3.89	B vs A & M	3.70 - 4.07	NO
21	3.42	A vs M &	3.24 - 3.60	YES
22	3.28	B vs A & M	3.12 - 3.45	YES
44	3.97	A vs M	3.75 - 4.20	NO
46	2.87	A vs M & B	2.70 - 3.05	YES
51	3.63	A vs M & B	3.44 - 3.83	YES
55	3.32	None	3.14 - 3.50	YES

The symbols used represent the following:

A: APRCE
M: MAJCOM
B: BASE

the APRCE with a mean of 2.90 agrees that adequate notice of project progression is provided.

Survey Question 13. I am notified of special project requirements (i.e. siting changes, extraordinary user requirements, etc.) as soon as possible.

No significant differences of opinion were detected from the analysis of this question. All levels slightly

disagreed, with a mean of 4.34, that their notification of special project requirements was adequate.

Survey Question 14. The speed and the quality of communications from the APRCE are adequate to meet the needs of the MCP process.

The APRCE disagreed with the base and the MAJCOM concerning this statement but this was expected. The APRCE, with a mean of 2.10, should be expected to consider its speed and quality of communication to be adequate. The base and MAJCOM were undecided in their opinions, with mean values of 3.84 and 4.03 respectively. The strength of the APRCE response pulled the total mean to 3.62 which indicated slight agreement that the APRCE provides adequate communications.

Survey Question 15. The speed and the quality of communication from the MAJCOM are adequate to meet the needs of the MCP process.

As might be expected, the MAJCOM shows a significant disagreement with the APRCE and the base concerning the speed and quality of their communications. The MAJCOMs, with a mean of 3.35, slightly agree that they provide adequate communications while the APRCE and the base are undecided with means of 4.35 and 3.97 respectively. The results indicate that the respondents were undecided concerning the communications of the MAJCOM, with a total mean of 3.84

Survey Question 16. The speed and the quality of communication from the base are adequate to meet the needs of the MCP process.

According to the data analysis for this question, the base has a problem providing rapid, quality communications to

both the APRCE and the MAJCOM. The mean of 3.89 shows that the overall population is undecided but an examination of the results indicates otherwise. The base mean is 3.23 which indicates slight agreement, but the APRCE and MAJCOM means are 4.65 and 4.46 respectively, and both are significant. Both the APRCE and the MAJCOM slightly agree that the speed and quality of base communications are not adequate.

Survey Question 21. The APRCE responds as quickly as possible to requests for help with MCP projects.

As expected, the APRCE's mean of 2.02 shows that they agree with this statement. The base slightly agrees, with a mean of 3.63, while the MAJCOM, with a mean of 3.80 remains undecided. The total mean of 3.42 shows a slight agreement that the APRCE responds as quickly as possible to requests for help with MCP projects.

Survey Question 22. The base responds as quickly as possible to requests for help with MCP projects.

The base agrees with a mean of 2.81, while the MAJCOM mean of 3.89 is undecided and the APRCE mean of 3.49 indicates slight agreement. The APRCE and the MAJCOM answers are essentially the same. Coupled with the base influence, this results in a total mean of 3.28 or an indication that the population slightly agrees that a sense of urgency can be communicated to the base and that timely help will follow.

The following questions were taken from the design section of the questionnaire.

Survey Question 44. The Design Agent understands the special requirements of the Air Force.

The total mean of 3.97 indicates indecision by the population. They can not decide if the DA understands the special requirements of the Air Force; only the APRCE could decide significantly. The MAJCOM and the APRCE differed significantly in their opinions while the base would not significantly agree. The APRCE with a mean of 3.40 slightly agreed, but the higher means of the MAJCOM and the base, 4.23 and 4.07 respectively, brought the total down to the undecided range. The base and the MAJCOM show very slight disagreement, but not to the degree determined to be significant by the decision rules of this study.

Survey Question 46. The predesign conference and site visits effectively ensure that the A/E understands the project requirements.

All levels agree that the predesign conference serves its purpose but disagree as to how well. The APRCE, with a mean of 2.08, agrees; the MAJCOM, with a mean of 2.96, also agrees; while the base, with a mean of 3.25, only slightly agrees with the statement. The analysis indicates that the MAJCOM and the base results are essentially the same while the APRCE is different.

The following questions were taken from the construction section of the questionnaire.

Survey Question 51. The Construction Agent understands the special requirements of the Air Force.

The APRCE significantly disagreed with both the base and the MAJCOM. The results indicate that the MAJCOM is undecided, with a mean of 4.11, that the base slightly

agrees, with a mean of 3.60, and that the APRCE agrees with a mean of 2.94. However, the total mean of 3.63 indicates that the population slightly agrees that the CA understands the special requirements of the Air Force.

Survey Question 55. The preconstruction conference provides an adequate forum to effectively coordinate the needs and requirements of everyone involved in the MCP construction process.

All three management levels agree in in their responses to this statement. The total mean of 3.32 shows the general opinion that they slightly agree that the preconstruction conference effectively communicates the needs of the individual agencies involved in the construction process.

Summary. The results of this section show that the communications from the APRCE and the MAJCOM are adequate, that the APRCE and base respond well to requests for assistance, that the predesign and preconstruction conferences effectively translate project requirements, and that the construction agent understands Air Force requirements. The problem areas indicated showed that the base communications were lacking, and that all levels of communication break down during special project coordination.

Research Question #4. How well are the given procedures implemented to ensure that the MCP process is effective?

This final research question considered the effectiveness of the players in performing their functions within the structure of the MCP process. The measurement questions in this area indicate how well the players are doing their job

as opposed to how well the MCP process is providing a structure within which to perform that job. Table 4.6 provides the results of the questions used in this section. The following questions were taken from the general section of the questionnaire.

Survey Question 11. I could perform my job more effectively if I had more authority.

The confidence interval for the mean contained the value of four which indicated that the APRCE was undecided concerning their need for additional authority, with a mean of 3.63. The base, with a mean of 2.74, and the MAJCOM, with a mean of 2.83, had significantly different opinions from that of the APRCEs. Both management levels agreed that they could perform more effectively with additional authority. The confidence interval for the total mean of 2.92 did not contain the value of four (undecided) which demonstrated a strong overall agreement with the need for additional authority. The difference in opinion was expected considering that the APRCE already possesses much more authority than either the base or the MAJCOM.

Survey Question 17. Adequate training programs are available to help me do my job effectively.

All levels were undecided, with a total mean of 3.94. No significant evidence to answer this measurement question was obtained, other than to note that the base would not strongly agree to this statement.

Survey Question 18. The bases adequately define the scope of projects during the programming phase.

TABLE 4.6

Research Question #4
Results of the Performance Questions

Question	Total Mean	Opinion Differences	95% Confidence Interval	95% Significance
11	2.92	A vs M & B	2.73 - 3.12	YES
17	3.94	None	3.75 - 4.14	NO
18	4.31	B vs A & M A vs M	4.12 - 4.51	YES
19	1.92	A vs B	1.77 - 2.06	YES
26	3.56	None	3.11 - 4.01	NO
27	3.35	M vs B	2.86 - 3.82	YES
28	2.81	None	2.43 - 3.19	YES
29	3.12	M vs B	2.78 - 3.45	YES
30	3.25	None	2.94 - 3.56	YES
32	3.04	None	2.60 - 3.47	YES
43	3.81	A vs M & B	3.59 - 4.04	NO
45	3.06	A vs M & B	2.84 - 3.28	YES
52	3.60	M vs A & B	3.39 - 3.81	YES
53	3.48	A vs B & M	3.25 - 3.71	YES
54	3.62	A vs M	3.42 - 3.82	YES

The symbols used represent the following:

A: APRCE
M: MAJCOM
B: BASE

The opinion of each level differed concerning this statement. The APRCE, with a mean of 5.53, significantly disagreed that the base provided adequate definitions of project scope while the MAJCOM, with a mean of 4.85, only slightly disagreed. As expected the base agreed, with a mean of 3.54, that they defined the project scope adequately, but only slightly. Apparently the base does have problems defining project scope, as indicated by the APRCE, the MAJCOM and the total mean of 4.31 which shows slight disagreement.

Survey Question 19. Project scope should be defined and solidified early in the programming process.

All levels agreed that project scope must be defined and solidified early in the programming process. The only opinion difference was between the APRCE and the base and this was only in strength of agreement with this statement. The APRCE and the MAJCOM strongly agreed, means of 1.39 and 1.87 respectively, while the base agreed, a mean of 2.13, but not strongly. The total mean of 1.92 showed a strong agreement over the entire population.

The following questions are those answered by the MAJCOM and the base in the programming section of the questionnaire.

Survey Question 26. The base selection of MCP projects effectively identifies command supportable projects.

There was no significant difference in opinion. The MAJCOM could not decide if the base can select command supportable projects. The mean of 3.56 was very close to

slight agreement though, since the 95% confidence interval ranged from 3.11 to 4.01.

Survey Question 27. The base preparation of 1391s is timely and complete.

The total mean of 3.35 indicates that the population slightly agrees with this statement, but there is a significant difference in opinion. The MAJCOM, with a mean of 4.57, was undecided and the base, with a mean of 2.52, agreed. The disagreement is significant but not enough to influence the total mean. The base preparation of 1391s is considered adequate.

Survey Question 28. The MAJCOM review of 1391s is timely and effective.

No significant difference between the means was detected for this question. The total mean of 2.81 indicates agreement.

Survey Question 29. The base preparation of PBs is timely and complete.

There was a significant difference in the opinions of the MAJCOM and base concerning this statement. The MAJCOM is undecided, with a mean of 3.71, while the base feels they can prepare adequate PBs, with a mean of 2.71. The total mean of 3.12 indicates slight agreement from the total population. The fact that the MAJCOM's results ranged from two to seven tends to dispute this result since nobody from the MAJCOM would strongly agree.

Survey Question 30. The MAJCOM review of PBs is timely and effective.

No significant differences were noted for this statement. The total mean of 3.25 indicates slight agreement with the statement that the MAJCOM PB review is effective.

Survey Question 32. The return of projects for additional information often causes project delays.

There were no significant differences of opinion concerning this question. The total mean of 3.04 shows only slight agreement that projects returned for additional information often cause delay. Considering that the base mean was 3.29 and the MAJCOM mean was 2.65 the results may show even stronger agreement.

The following questions were taken from the design section of the questionnaire.

Survey Question 43. The Design Agent (DA) effectively manages the A/E.

There were significant differences of opinion between the AFRCE and both the MAJCOM and the base for this statement. The total mean of 3.88 indicates that the population is undecided. The AFRCE mean of 3.21 shows slight agreement with this statement but the MAJCOM, mean of 4.04, and the base, mean of 3.96, are undecided. Overall, the results indicated an undecided population.

Survey Question 45. The functional review comments of the base are incorporated into the design, when they are necessary and reasonable, by the Design Agent.

The total mean of 3.06 indicates slight agreement with the statement that the DA incorporates base comments. As expected, the AFRCE, mean of 1.79, shows strong agreement

while the base, mean of 3.60, and MAJCOM, mean of 3.27, only slightly agree with this statement.

The following questions were taken from the construction section of the questionnaire.

Survey Question 52. The Construction Agent (CA) is on site enough to adequately inspect the project.

The MAJCOM remained undecided, mean of 4.13, concerning this statement which was significantly different from both the APRCE and the base opinions. The strongest agreement was provided by the APRCE, with a mean of 2.90, which was expected, while the base only slightly agreed, with a mean of 3.54. The total mean of 3.60 indicates that the total population slightly agrees that the CA adequately inspects their projects.

Survey Question 53. The APRCE adequately represents base and user interests to the Design and Construction Agents.

Both the MAJCOM, mean of 4.01, and the base, with a mean of 3.77, are undecided concerning this statement. The APRCEs opinion is significantly different. The APRCEs mean of 2.00 shows agreement with the statement that they adequately represent the base and user. The total mean of 3.48 indicates the population slightly agrees with this statement.

Survey Question 54. The Construction Agent effectively manages the construction contractor.

The total mean of 3.62 indicates slight agreement that the CA manages the contractor effectively. The only significant difference is between the APRCE and the MAJCOM.

The APRCE's mean of 2.94 indicates agreement while the MAJCOM's mean of 4.11 indicates that they are undecided. The base, with a mean of 3.58, slightly agreed with the statement.

Summary. This section showed that project scope should be defined early, that the base satisfactorily selects command supportable MCP projects, the base prepares adequate project books (PBs), the MAJCOM reviews 1391s and PBs adequately, the DA uses base comments, the CA adequately inspects construction, the APRCE represents the base and user well, and that the CA manages the contractor well. The problem areas showed that the base and MAJCOM would like more authority, the base does not develop adequate 1391s, and that projects returned for additional information often cause delays. The final result, that the base does not define the project scope well, directly contradicts the opinion that the base prepares adequate PBs.

Open-Ended Questions.

This section was purposely separated from the research questions because the results have no statistical significance but are used to support and amplify the results obtained from questions 7 through 58. The results from these last three questions are the opinions of some of the respondents, and represent support for the results of the research questions above. As such, the results of this section primarily represent areas for further thought or

TABLE 4.7

Open Ended Question: Question 59
Problems That Hinder MCP Effectiveness

Problem	Frequency	Percentage*
The Programming	42	22
The Length	38	20
The Design & Construction	30	16
The Project Book	25	13
The Politics	18	9

* Based upon the 192 respondents to this question.

analysis and are presented with that in mind. The three open ended questions are presented below and, as in the previous section, the questionnaire number is used for reference to the questionnaire, which is in appendix A.

Survey Question 59. Please describe any problems that, in your opinion, hinder the effectiveness of the MCP process.

Generally, 87% of the respondents to this question found the MCP program to be ineffective in some way. These respondents identified five primary areas of concern. The frequency that each subject was referred to is shown in Table 4.7. The five areas of concern were with the programming, the length, the design and construction, the project book and the politics.

Programming. Two problem areas were referred to by those respondents who considered programming a problem: The

using agencies and the definition of scope. The primary problem identified with the using agency was an inability to obtain adequate and complete information from them. Using agencies would not respond in a timely manner or could not obtain physical requirements from the vendor for specialized facilities. In addition, many respondents felt that the engineers were not adequately trained to relate with the user and could not obtain enough information to fully define project scope which was identified as the second programming problem.

According to the respondents, the problem with the definition of scope stemmed from a lack of time to adequately prepare project documentation prior to required submittal dates. This was further compounded by the difficulty of defining requirements for projects which would not be constructed for another four or five years. One suggested solution was to require programmers to be architects since they are trained to deal with the customers and to define their needs.

Length The overall length of the MCP process, from need identification to occupancy, was noted as a problem by 22% of the respondents. Specifically, they identified the programming, design, and modifications processes as excessively long when compared to industry standards. These areas were seen as problems because each phase is so long that by the time it is finished, either the requirements,

technology, mission or key personnel have changed. This often results in redesign and, inevitably, increased costs.

Design and Construction. The respondents that indicated problems in this area primarily referred to the review process and the change process. The base and MAJCOM respondents felt that adequate time was not available for reviews and that the comments made were not incorporated. The AFRCCE respondents felt that the comments made during design were few and had little impact, while requests from the civil engineering shops appeared during construction and represented excellent ideas which should have been incorporated in the project book.

The modifications problem concerned the number of modifications which occurred during both design and construction. The respondents noted that changes during the design and construction stage often resulted in time delays and cost increases for items which should have been identified during programming.

Project Book. The primary complaint was that the project books were all too often poorly defined because of problems discussed above. A lack of adequate preparation time and user participation in the development of the project book were common concerns of the respondents. One respondent noted that they may only have as many as

five days to accomplish all the DD Form 1391 documentation as well as the Project Book. Working with such blinding speed causes us some concern about our thoroughness.

Politics. Many respondents strongly felt that politics at all levels hindered MCP effectiveness. They complained about new commanders playing with project scope and reprioritizing projects resulting in additional time and cost. They talked about the difficulty of getting needed MCP projects from an arbitrary Congress. One respondent captured this concern as follows:

The MCP is a creature of the Congress, and reflects the interests (good, bad or indifferent) of the voting public. To my knowledge no other program is scrutinized line item by line item. Location and costs of our facilities are important to a representative or senator, showing that he is responsive to his constituents. This is the inefficient way that a democratic republic works. If you want efficiency, get a benevolent despot, but by all means make sure that he is benevolent.

Survey Question 60. Please describe any suggestions which you feel could enhance the effectiveness of the MCP process.

The responses to this question in many cases resulted in a restatement of problems identified in survey question 59, as opposed to identification of suggestions to improve MCP effectiveness. Apparently there are many complaints, but few people have considered plans for improvement. Those suggestions mentioned most often are listed in Table 4.8.

Suggestions for improving programming and project books (PBs) are not included in Table 4.8. They were mentioned as primary problems for this question but no single suggestion proved to be mentioned more than three times. The suggestions included recommendations to reduce the number of MCP submittals, form AFRCE/MAJCOM traveling review teams,

TABLE 4.8

Open Ended Question: Question 60
 Suggestions to improve MCP Effectiveness

Suggestion	Frequency	Percentage*
Restructure the AFRCE	29	17
Eliminate the Agencies	27	16
Design/Build	7	4

* Based upon the 167 respondents to this question.

better pricing guides, dedicated MCP personnel, and earlier validation of projects. Further suggestions to improve PB quality included A/E preparation and PB automation.

There were four primary suggestions which were relatively common. These four suggestions were, to restructure the AFRCE, eliminate the design and construction agencies, limit design changes, and to use a design/build philosophy.

Restructure the AFRCE. Two primary options were identified. Either eliminate the AFRCE or move it to the MAJCOM level like the SAC AFRCE. The respondents felt that these options would allow the MAJCOMs to deal directly with the design and construction agents, effectively eliminating a level of bureaucracy. They felt that the MAJCOM and base are closer to the programmers driving the project, would better

understand what should be built, and would more effectively and efficiently manage the MCP program.

Eliminate the Agencies. Primarily, the respondents referred to the Corps of Engineers (COE), but the Navy was also mentioned. The respondents generally felt that the Air Force was capable of performing the agent's responsibilities and, as necessary, could contract for an A/E. Fifteen respondents who answered question 59 felt that there were too many management levels involved with the MCP program. Apparently, the respondents' answer to this problem is to eliminate some management levels to increase responsiveness of the MCP system.

Design/Build. The design/build approach involves hiring a firm capable of both designing and constructing a facility, effectively eliminating the construction advertising requirements. Respondents felt that facility costs would decrease while functional requirements would be better satisfied because of the decreased time for design and construction and the increased continuity offered by a design/construct contractor.

Survey Question 61. Please list examples of additional authority which would help you better perform your job.

A total of 76% of the respondents to this question felt that their management level required additional authority. The base, the MAJCOM, and the APRCE each had some percentage of respondents who felt that more authority would be helpful.

TABLE 4.9

Open Ended Question: Question 61
Requests for Additional Authority

Functional Level	Frequency	Percentage*
BASE	35	27
MAJCOM	26	20
AFRCE	15	12

* Based upon the 128 respondents to this question.

Table 4.9 lists the frequencies that each management level requested additional authority.

Base. base respondents believed that they needed authority to approve A/Es, to get user inputs, control contingency funds, and provide technical comments. The two most common needs for authority mentioned were for general construction inspection and authorization to make on the spot construction changes. Many base respondents expressed displeasure with the CA and wanted the authority to either partially control the CA or to perform the inspection themselves. One frustrated respondent noted that

when we see the COE [Corps of Engineers] giving away the ball game we should have the authority to insist on proper construction mgt [management].

Also, the base respondents felt strongly that a small field change authorization for the base would help. For example,

one respondent related the process necessary to make a small field change.

Currently, if there is a small field problem (ex. a need to relocate a fire hydrant) the base has to write to [the] APRCE who writes the Corps (Omaha) who writes the Corps (base level). It takes 2 months to fix the small problems.

MAJCOM. The MAJCOM noted four areas where they could use more authority. They wanted more funds control, direct access to the A/E, design and construction change authority, and to assume APRCE responsibilities. The respondents felt they needed funds control to allocate and reallocate funds, depending upon cost and project status, rather than accepting decisions from detached experts who are not familiar with MAJCOM or base requirements. They felt a need for direct access to the A/E, to ensure that their functional comments were considered during design. Further, they wanted authorization to make changes in both the design and construction phases in order to ensure timely reaction to mission essential requirements, rather than the cumbersome response that now exists. With the MAJCOM gaining all of this added responsibility, the APRCE would cease to be necessary. Understandably, assuming the total responsibility of the APRCE was the most common request for authority among all of the MAJCOM respondents to this question.

APRCE. The APRCE overall seemed to be very happy with their level of authority. They primarily believed that they should be allowed total approval and disapproval of all

change requests after 35% to ensure that change requests indeed represent mission essential changes. They also wanted more freedom to manage design and construction dollars.

V. Conclusions and Recommendations

Chapter Overview

This final chapter presents the conclusions based upon the results discussed in chapter IV. The answers to the four research questions are presented followed by the overall conclusions of this study. Finally, areas for further research suggested by the results of this study are presented. The reader should keep in mind the conclusions are based on the perceptions of the respondents from AFRCE, MAJCOM, and base level.

Conclusions

Research Question #1. This question was termed the interpretation question.

Do the players feel confident that the rules and regulations provide enough information, and are current enough for them to effectively understand their job within the MCP?

The survey results indicated that the rules and regulations, with the exception of two manuals, are understood by all the players in the MCP. The AFRCE, the MAJCOM and the base all agree that they understand how the system works and how they should operate within it.

The only difficulties expressed were with APM 86-2, Standard Facility Requirements, and APM 88-2, Definitive Designs of Air Force Structures. Neither manual was considered adequate and respondents felt that they needed

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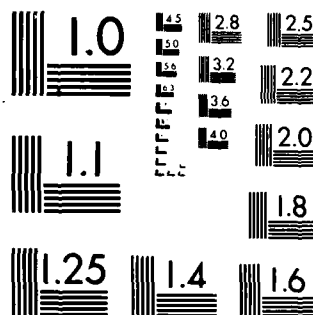
AN INVESTIGATION CONCERNING PERCEPTIONS OF MILITARY
CONSTRUCTION PROGRAM. (U) AIR FORCE INST OF TECH
WRIGHT-PATTERSON AFB OH SCHOOL OF SYST.. G B DUTCHER
SEP 86 AFIT-GEN/LSH/865-10 F/G 13/2

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revision. APM 88-2 was not assessed as useful at any management level working in either the programming or the design phase of the MCP. APM 86-2 was rejected by the programmers. The design and construction personnel at the AFRC and the MAJCOM also leaned toward the opinion that APM 86-2 is not current or useful.

Research Question #2. This question was termed the structure question.

Are the regulations, guidance and procedures effectively providing a structure which allows efficient operation of the MCP?

Overall, the structure is adequate. This conclusion was strongly supported by the results of the questionnaire. The design process is providing good designs and the A/Es are being used effectively. The construction process is working and deficiencies are being identified. The system, however, was not viewed as very efficient.

The base is not providing all the information that the A/E needs to design the project. Additional effort is needed in compiling project books and the MAJCOM should ensure this occurs. The MAJCOM review process is adequate but needs more attention to ensure that the project book provides better overall support to the A/E. This conclusion was supported by the structure questions and very strongly supported by the open-ended questions. Lack of time was considered a significant reason for the problems with the project book.

The project review process identifies deficiencies; but, the review process is excessively long and has a tendency toward delay. Delays, as indicated by the open-ended questions, are caused by the politics of the system and the extra layers of management (APRCE, DA and CA). Many respondents projected a concern that Congress supported projects based upon political favors and that many projects live or die depending upon the current commander at the base or the MAJCOM. The APRCE, DA and CA are seen as management levels which hinder the review process. Because they are part of the structure, they must review all projects under the current MCP process.

Finally, design errors are causing delays and change orders during the construction phase. This result contradicts the statement that the design review process works and implicates all levels of management. The CA, DA, APRCE, MAJCOM and base must look closer at their reviews. The final test of a design is how well it can be constructed. The fact that many significant design errors do show up during construction supports the conclusion that the design review process does not adequately identify all of the technical, functional, or maintainability problems of the project design.

Research Question #3. This question was termed the communication question.

How effective are the informal and formal communications between the players (APRCE, MAJCOM, and base)?

Over the entire MCP process, the communication between the organizations and agencies involved works fairly well. The only problem identified is at the base level. The formal mechanisms designed to ensure communication between the agencies and the management levels are working. The predesign and pre-construction conferences both ensure that requirements are passed around to the individuals and organizations that need the information. Both the design and construction agents have developed an understanding of the Air Force requirements.

The communication process which supports the overall flow of information also provides timely data, but not at all levels and not during the implementation of special projects. The base does not provide timely communications to the AFRCE and the MAJCOM. However, the most significant finding was that the communications process breaks down at all levels during the time crunch of special project implementation. The respondents felt that they did not have adequate notification of special project requirements. All management levels need to understand that communications are still essential when special projects are inserted into the MCP.

Research Question #4. This question was termed the performance question.

How well are the given procedures implemented to ensure that the MCP process is effective?

The AFRCE and the MAJCOM are performing very well; even the agents are performing well in both the design and

construction arenas. The bases though, need to better define the total scope of their projects during preparation of DD Forms 1391 and project books. The results clearly indicate that projects are often returned during the programming phase resulting in delays. The primary reason for return was seen as incomplete 1391s and project books. The existence of a problem with the project books was further supported by the results of the open-ended questions. There was a high recurrence of complaints concerning the project book and the programming phase where it is created.

Overall Conclusions

Based upon the perceptions of the main players of the Military Construction Program, the programming, design and construction systems are working but could be much more efficient. Primarily, the programming phase needs improvement in the area of project scope definition. Emphasis needs to be placed at the base to support their efforts to define project scope so that the programming documents are accurate and complete. The design and construction phases must also be streamlined as they are hampered by extra levels of management and a cumbersome design and construction process.

Programming. The Air Force must ensure that project scope is properly and fully defined, and that the manuals supporting the programming phase are current and effective. Projects are frequently being returned for additional

information. The 1391s and the project books prepared by the base are not adequate. The results of the open-ended questions provided frequent complaints from the base that current up to date data was not always available. The using agencies are not fully involved and the base has no means to get their full support. There was also strong evidence that the base engineers and programmers are not adequately trained to relate with the users and obtain the information that is necessary to fully define the scope of a project. The techniques and methods of dealing with users are taught to the architects. Either architects should become programmers, or the current programmers should be taught the skills necessary to obtain all required information.

AFM 86-2, Standard Facility Requirements, and AFM 88-2, Definitive Designs of Air Force Structures, were both viewed as out of date. Both contain data which can ease the process of defining the scope of many projects, but are not current. The Air Force needs to update these manuals, provide support materials, training and authority which will allow the base to fully define project scope.

Design and Construction. Accomplishing changes is taking much too long and is not always accurate. The changes process increases the project approval time. The Air Force needs to examine ways of streamlining the process. One suggested method, strongly supported by the open-ended

questions, is to reduce the extra layers of management peculiar to the design and construction process.

The perception of the MAJCOM is that they need much more authority to perform their job. The indications from the open-ended questions were that AFCE level authority, vested at the MAJCOM, would solve the cumbersome nature of the design and construction process.

Finally, the review process, while viewed as adequate by all respondents, is not identifying all of the design deficiencies. Technical, functional and maintainability deficiencies are still causing delays during project construction. It is evident that the design review process is not as efficient as it should be. And, the design and construction agents are part of that problem. All levels of Air Force management need to look hard at this problem.

Follow-on Recommendations

Two specific problems with the MCP were identified and should be further investigated. First, project scope needs to be better defined and second, the length of the design and construction phases needs to be reduced. Both of these areas warrant further research.

To address the problems associated with the apparent inadequacy in the definition of project scope, numerous questions must be answered concerning the programming process. Two examples concern adequate user involvement and earlier scope definition.

Possibly, the Work Information Management System (WIMS) computer, which is being installed throughout civil engineering, can be modified to help solve the programming problems. The WIMS could include systems to aid programmers in creating DD Forms 1391. A computer model of the 1391 should be designed which guides the programmer through the creation process and has a computer aided design capability with access to as-built drawings. This would allow the programmer to quickly determine explosive distance criteria, satisfy compatible use zone criteria, and possibly explore environmental impacts and a host of other possibilities. A system to aid engineers should also be designed. This system should provide a program for preparing project books with the same computer aided design capabilities, to include cost estimating and functional review models keyed on base peculiarities.

The next recommendation concerns methods of reducing the length of the MCP process. Two areas of research are needed. First, the concept of design/build has been very successful in the construction industry and holds great promise for increasing the efficiency of the MCP design and construction process. The benefits of such an approach should be examined even though this would require major revisions to the current MCP structure. Obviously, a parallel study should investigate organization and public law changes which would

allow the MCP system to utilize the benefits of design/build contractors.

Finally, this study suggests that by reducing the levels of management both project review and design and construction changes will take less time. The feasibility and support for this type of approach to increasing the efficiency of the MCP program should be examined and documented since the gain could be significant.



Appendix A: Questionnaire

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY
WRIGHT-PATTERSON AIR FORCE BASE OH 45433-6583

REPLY TO
ATTN OF LSG (Capt Dutcher)

SUBJECT Survey of the Military Construction Program (MCP)

TO Survey Participant

1. Please take a few moments to complete the attached questionnaire and return it and the response sheet within the next five working days. The questionnaire is designed to collect the perceptions of the bases, the Major Commands, and the Air Force Regional Civil Engineers, concerning the performance of the MCP process. Your inputs, consolidated with those from around the Continental United States, will represent the differing views of the three primary players within the MCP and should provide a strong basis for future MCP improvements and follow-on studies.

2. One of the most important goals of this study is to obtain results that are truly representative of the opinion of each organizational level. Your organization has been chosen randomly from among the total pool of organizations involved in the MCP program. Participation in this survey is voluntary. But, for the results to be as accurate as possible, it is very important for each questionnaire to be accurately completed, your answers recorded on the OPSCAN sheet provided and promptly returned in the attached envelope.

3. The results of this survey will be made a part of the Department of Defense data base. If you wish a summary of these results please print your name and address on the back of the return envelope. Please do not put this information on the questionnaire.

4. Thank you for your assistance.

Larry J. Blake
Larry J. Blake, Capt, USAF
Thesis Advisor

3 Atch
1. Questionnaire
2. AFIT Form 11E
3. Return Envelope

STRENGTH THROUGH KNOWLEDGE

Survey of Perceived
MILITARY CONSTRUCTION PROGRAM
Effectiveness

This survey contains five types of questions: Demographic, General, Programming related, Design related and Construction related. After answering the Demographic and General questions you will be guided to the survey questions applicable to your current job. Please consider each question carefully and answer it without prejudice.
Thank you.

DEMOGRAPHIC: The following questions serve to categorize groups of respondents for statistical analysis only. Your anonymity is assured as the data can not be used to identify individual respondents.

1. At what organizational level are you working?

(1) Base/DEEV	(2) Base/DEEE
(3) Base/DEEC	(4) MAJCOM/DEP
(5) MAJCOM/DEE	(6) APRCE
(7) Other _____	

2. To which MAJCOM are you assigned? (If your command is not listed please proceed to question 3.)

(1) APCC	(2) AFLC
(3) APSC	(4) ATC
(5) AU	(6) ESC

3. To which MAJCOM are you assigned?

(1) Space Command	(2) SAC
(3) TAC	(4) MAC

4. By which APRCE are you serviced?

(1) Eastern	(2) Central
(3) Western	(4) Other _____

5. What is your current grade?

(1) E-1 to E-5	(2) E-6 to E-9
(3) O-1 to O-3	(4) O-4 to O-6
(5) GS-1 to GS-5	(6) GS-6 or above
(7) Other _____	

6. How many cumulative years of experience do you have in your current job?

- (1) less than 12 months (2) 13 months to 24 months
(3) 25 months to 60 months (4) 61 months or greater

While drawing on experiences from your current job (as marked in question 1) please answer the following questions concerning the Military Construction Program.

GENERAL: All respondents should answer the following questions using the scale shown.

STRONGLY AGREE	AGREE	SLIGHTLY AGREE	UNDECIDED	SLIGHTLY DISAGREE	DIS- AGREE	STRONGLY DISAGREE
1	2	3	4	5	6	7
:	:	:	:	:	:	:

7. The available regulations, procedures, pamphlets and guidance clearly define the responsibility, authority and accountability of the APRCE in the MCP process.
8. The available regulations, procedures, pamphlets and guidance clearly define the responsibility, authority and accountability of the MAJCOM in the MCP process.
9. The available regulations, procedures, pamphlets and guidance clearly define the responsibility, authority and accountability of the Base in the MCP process.
10. The project review process is lengthy and unwieldy and tends to delay projects.
11. I could perform my job more effectively if I had more authority.
12. I have enough advance notice of project progression through the MCP process to manage projects effectively.
13. I am notified of special project requirements (i.e. siting changes, extraordinary user requirements, etc.) as soon as possible.
14. The speed and the quality of communication from the APRCE are adequate to meet the needs of the MCP process.
15. The speed and the quality of communication from the MAJCOM are adequate to meet the needs of the MCP process.

STRONGLY AGREE	AGREE	SLIGHTLY AGREE	UNDECIDED	SLIGHTLY DISAGREE	DIS- AGREE	STRONGLY DISAGREE
1	2	3	4	5	6	7
:	:	:	:	:	:	:

16. The speed and the quality of communication from the base are adequate to meet the needs of the MCP process.
17. Adequate training programs are available to help me do my job effectively.
18. The bases adequately define the scope of projects during the programming phase.
19. Project scope should be defined and solidified early in the programming process.
20. Changes to projects are accomplished in a timely manner.
21. The APRCE responds as quickly as possible to requests for help with MCP projects.
22. The base responds as quickly as possible to requests for help with MCP projects.

PROGRAMMING: These questions are intended for those respondents who deal with the MCP programming process. Base/DEEC respondents proceed to questions 48. All other respondents should proceed to question 34.

23. APM 86-2, Standard Facility Requirements, is current and useful.
24. APM 88-2, Definitive Designs of Air Force Structures, is current and useful.
25. APR 86-1, Programming Civil Engineer Resources, is current and useful.
26. The base selection of MCP projects effectively identifies command supportable projects.
27. The base preparation of 1391s is timely and complete.
28. The MAJCOM review of 1391s is timely and effective.
29. The base preparation of PBs is timely and complete.
30. The MAJCOM review of PBs is timely and effective.

STRONGLY AGREE	AGREE	SLIGHTLY AGREE	UNDECIDED	SLIGHTLY DISAGREE	DIS- AGREE	STRONGLY DISAGREE
1	2	3	4	5	6	7
:	:	:	:	:	:	:

31. The MAJCOM Facilities Review Board effectively performs its function of selecting and prioritizing supportable MCP projects.
32. The return of projects for additional information often causes project delays.
33. Due to the difficulty of meeting deadlines required by OSD and Congress for MCP submittals many projects are recycled until the following year.

Please proceed to question 59.

DESIGN

34. APM 86-2, Standard Facility Requirements, is current and useful.
35. APM 88-2, Definitive Designs of Air Force Structures, is current and useful.
36. APR 88-3, New Construction (Air Force Contract Construction), is current and useful.
37. APR 88-18, Air Force Regional Civil Engineers, is current and useful.
38. APR 88-31, Selecting A&E Firms, is current and useful.
39. The MCP design process provides quality MCP facility designs.
40. The PB provides adequate design information for the A/E.
41. The A/E selection process assures that the most qualified A/Es are selected.
42. We are effectively using A/Es to design MCP projects.
43. The Design Agent effectively manages the A/E.
44. The Design Agent understands the special requirements of the Air Force.

STRONGLY AGREE	AGREE	SLIGHTLY AGREE	UNDECIDED	SLIGHTLY DISAGREE	DIS- AGREE	STRONGLY DISAGREE
1	2	3	4	5	6	7
:	:	:	:	:	:	:

45. The functional review comments of the base are incorporated into the design, when they are necessary and reasonable, by the Design Agent.
46. The predesign conference and site visits effectively ensure that the A/E understands the project requirements.
47. Functional and maintainability problems are adequately identified during the functional review process.

Please continue with the construction questions.

CONSTRUCTION

48. AFM 88-15, Criteria and Standards of Air Force Construction, is current and useful.
49. APR 89-1, Design and Construction Management, is current and useful.
50. The MCP design process provides quality facilities.
51. The Construction Agent understands the special requirements of the Air Force.
52. The Construction Agent is on site enough to adequately inspect the project.
53. The APRCE adequately represents base and user interests to the Design and Construction Agents .
54. The Construction Agent effectively manages the construction contractor.
55. The preconstruction conference provides an adequate forum to effectively coordinate the needs and requirements of everyone involved in the MCP construction process.
56. Construction deficiencies are adequately identified during the pre-final/final inspection and acceptance.
57. Remaining deficiencies and warranty problems are adequately identified during the post-final inspection.
58. Design errors contribute significantly to project delays and change orders.

These final three questions are designed for all respondents. Please answer them based upon your perceptions of the Military Construction Program.

59. Please describe any problems that, in your opinion, hinder the effectiveness of the MCP process.

60. Please describe any suggestions which you feel could enhance the effectiveness of the MCP process.

61. Please list examples of additional authority which would help you better perform your job.

Please return the completed survey in the envelope provided.
Thank you for your time and effort.

Appendix B: Questionnaire Cover Letters



DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY
WRIGHT-PATTERSON AIR FORCE BASE OH 45433-6583

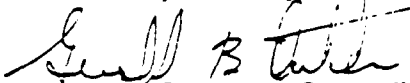
REPLY TO LSG (Capt Dutcher/255-5495)
ATTN OF

SUBJECT Survey of the Military Construction Program (MCP)

TO DEE

1. I would appreciate your assistance in distributing these questionnaires to your personnel. They are intended for those individuals who regularly work with the MCP programming, design and construction process to include Military, Civilian, Supervisor, Engineer, Architect and construction management technician. If you have any questions please feel free to call me.

2. Thank you for your efforts.


Gerald B. Dutcher, Capt, USAF
Student
Graduate Engineering Management

1 Atch

Questionnaire pkg.

STRENGTH THROUGH KNOWLEDGE



DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY
WRIGHT-PATTERSON AIR FORCE BASE OH 45433-6583

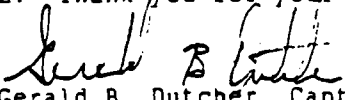
REPLY TO
ATTN OF: LSG (Capt Dutcher/255-5435)

SUBJECT: Survey of the Military Construction Program (MCP)

TO: DEP

1. I would appreciate your assistance in distributing these questionnaires to your personnel. They are intended for those individuals who regularly work with the MCP programming, design and construction process to include Military, Civilian, Supervisor, Engineer, Architect and construction management technician. If you have any questions please feel free to call me.

2. Thank you for your efforts.


Gerald B. Dutcher, Capt, USAF
Student
Graduate Engineering Management

1 Attch

Questionnaire pkg.

STRENGTH THROUGH KNOWLEDGE



DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY
WRIGHT-PATTERSON AIR FORCE BASE OH 45433-6583

REPLY TO
ATTN OF LSG (Capt Dutcher/255-5435)

SUBJECT Survey of the Military Construction Program (MCP)

TO ROE

1. I would appreciate your assistance in distributing these questionnaires to your personnel. They are intended for those individuals who deal with the MCP design and construction process to include Military, Civilian, Supervisor, Engineer and Architect. If you have any questions please feel free to call me.

2. Thank you for your efforts

Gerald B. Dutcher, Capt, USAF
Student
Graduate Engineering Management

1 Attch
Questionnaire pkg.

STRENGTH THROUGH KNOWLEDGE

Appendix C: List of Acronyms

APRCE: Air Force Regional Civil Engineer
BCE: Base Civil Engineer
CA: Construction Agent
CBD: Commerce Business Daily
COE: Corps of Engineers
CONUS: Continental United States
CWE: Current Working Estimate
DA: Design Agent
DI: Design Instruction
PUB: Facility Utilization Board
MAJCOM: Major Command
NTP: Notice to Proceed
OSD: Office of the Secretary of Defense
PA: Programmed Amount
PB: Project Book
SOCE: School of Civil Engineering

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VITA

Captain Gerald B. Dutcher was born on 23 April 1953 in Santa Rosa, California. He graduated from Santa Rosa High School in 1971 and received the degree of Bachelor of Science in Engineering from San Francisco State University in May 1978. Upon graduation, he received a commission in the USAF through the ROTC program. He was employed as an engineer by the Veterans Memorial Hospital in San Francisco, until called to active duty in September 1978. He was first assigned to the 305th Civil Engineering Squadron, Grissom AFB, Indiana as a project engineer and in July 1981 went to a remote assignment at the 554th Civil Engineering Squadron, Heavy Repair, Kunsan AB, Korea as the Chief of Design. He began Squadron Office School, in residence, in August 1981 and proceeded to the 36th Civil Engineering Squadron, Bitburg AB, Germany in October 1981. At Bitburg AB, Capt Dutcher served as a civil engineer in the design branch until December 1982, when he became the Chief of Contract Management. He entered the School of Systems and Logistics, Air Force Institute of Technology in May 1985.

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In this thesis the primary inefficiencies of the Military Construction Program (MCP), as commonly perceived by the Air Force Region Civil Engineer (AFRCE), the Major Command (MAJCOM), and the bases are identified. These three management levels are the primary managers of the MCP program. The MCP problems identified included inadequate definition of scope at the inception of MCP projects, and ineffective technical and functional design reviews.

Data was gathered from the AFRCE, the MAJCOM and the base through 770 questionnaires, mailed throughout the continental United States. All of the personnel involved with the MCP were surveyed at the AFRCEs and the MAJCOM. The base personnel were randomly sampled.

The methodology used involved a oneway analysis of variance of the mean responses, from the AFRCE, the MAJCOM and the base, to a seven point likert scale. Significant opinion differences were verified with the Scheffe test for all possible comparisons.

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